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USSR Report

ECONOMIC AFFAIRS

No. 980

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ECONOMIC POLICY, ORGANIZATION, AND MANAGEMENT

FUNCTIONAL COST ANALYSIS DETAILED

FCA --Thrift, Economy Method

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 6, Jun 81 pp 3-6

[Unsigned introduction: "The Experience of the Ministry of Electrical Products Industry"]

[Text] The 26th CPSU Congress has oriented all segments of the national economy toward a strict regime of economy and thrift. This requires a system of measures aimed at fuller utilization of all forms of resources--labor, energy, raw materials and supplies, equipment and production capacities, reduction of losses and waste, and elimination of unproductive expenditures. FAC*, which is cost analysis by function, can be of great help here.

FCA differs fundamentally from the ordinary "conventional" methods of production cost reduction, since it provides for the use of the functional approach, which presupposes that the most economical methods are found of performing all of a product's functions. Moreover, the product being rationalized is not perfected in its concrete form, but as a set of functions which it performs or should perform.

According to the theory of FCA, the production cost of any industrial product, aside from the minimum costs absolutely indispensable to the product's performance of given functions, always contains additional or superfluous costs, resulting mainly from the imperfection of the design. If one is to discover the reason of the excessive costs, he must first make a straightforward statement of the product's functions, which are divided into basic and auxiliary functions.

The basic functions are the functions whose performance was the very purpose of creating the particular product. The auxiliary functions are those which support performance of the basic functions. The auxiliary functions are in turn divided into essential and nonessential, necessary and superfluous. Following a thorough analysis of both the basic and auxiliary functions and after the unnecessary functions have been eliminated, attempts are made to find the most economical method of performing all the rest. The central point in FCA is to compile alternative versions of the performance of functions in value terms, and the purpose of this is to select the optimum variant.

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* FCA--functional cost analysis.

Development of FCA research in the CEMA countries has resulted in the drafting of a GDR standard and adoption of a resolution on application of FCA by the GDR Price Committee. In Dresden a national center has been set up for management of functional cost analysis. In Poland and Czechoslovakia centers have been set up for training and retraining personnel in FCA, as well as to coordinate the activity of enterprises. FCA methods have also become widespread in the capitalist countries.

Further development of FCA requires that attention be paid to a number of problems.

Breaking down (differentiation) of the subject of the study in the process of analysis. Technology is developing both toward division of functions among identical elements and also toward bringing together elements to perform different functions in products that have more than one function (for example, in electronics). At the same time any analysis (of an economic activity or a technological operation in the setting of technical norms) calls for breaking down the subject of the investigation into its elements. For example, the further we go in dividing an operation into its constituent elements in the process of technical norm-setting, the more detailed will be our study of those elements from the standpoint of eliminating unnecessary expenditures of time, and the more sound will be the standard time we obtain as compared to the results of norm-setting based on the methods of experimental statistics or less detailed methods. It can be said by analogy that breaking down the subject thoroughly into its functions is revealing more and more new ways of eliminating superfluous costs. This means that we need to learn how to make a thorough differentiation of the subject into its functions in accordance with the FCA method.

The interrelationship of FCA with the systems approach in analyzing products being designed. It is most fruitful to combine the systems approach and the functional approach. The systems approach calls for the following:

a) statement of the problem, definition of the goal and criteria;

b) structural analysis of the subject and development of conceptions of its development and improvement;

c) creation of a model and performance of an analysis by simulation;

d) synthesis of the system after the results of simulation have been obtained.

Experience in using FCA in the USSR and abroad confirms that the present-day functional approach supplements systems analysis by imparting concrete principles, methods and procedures and enhances the effectiveness of the technical-and-economic solutions. Thus the task is to supplement the systems approach with the methods of FCA.

Expansion of the fields of application of FCA as an instrument for analyzing the problems of organizational economics. Functional analysis is beginning to be used not only as a method of reducing production costs, but also for improving planning and management with target programs, for substantiating levels of specialization and cooperation in the production of complex products and to solve other problems of the national economy. It being understood that the methods of FCA are not all-embracing, there is still a need to strive for expansion of its sphere of application--this is a real source of economy.

Our journal treated the topic of FCA when this method was just beginning to be introduced (EKO, Nos 1 and 2, 1973). Now we would like to talk about the experience of using FCA which has been acquired by the electrical equipment industry, where it has been in use since 1974. The success in that industry has resulted from the kind of support given it at all levels of management and administration. The industry has a coordinating council for FCA headed by a deputy minister, a head institute for FCA was designated in the ministry, and a laboratory for FCA was set up. Head institutes were designated in each subindustry, and within them there were subdivisions responsible for performance of FCA. At many enterprises and associations in the industry there are permanent or temporary FCA groups. Nor were the results long in coming: In just the 1977-1978 period adoption of FCA recommendations brought a cost saving of 12 million rubles in the industry, including nearly 10 million rubles of physical resources.

One of the most immediate tasks is to make the transition to organization of FCA in the stage of product design and development and also to extend it to the technology and organization of manufacturing the product. After all, the effectiveness of FCA is several times greater in the stage of creating new technology than in the stage of improving the technology already being manufactured. Two conferences held in 1980--in Voronezh and Moscow--have helped to disseminate know-how in this field.

We hope that the selection of articles we are publishing will interest our readers working in the most diverse fields, since FCA is a universal method and points the way to the future.

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proizvodstva", 1981

Resources Analysis, Management System

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 6, Jun 81 pp 7-18

[Article by M. G. Karpunin, candidate of economic sciences, Moscow]

[Text] The decisions of the party and government on further improvement of the economic mechanism place responsibility for meeting the needs of the national economy and the public for products in the necessary assortment and quality upon the ministries of sectors and industries which are the main ministries in production of the respective product. Discharging this responsibility when there are limitations on resources is a serious economic problem. An industry's activity from the standpoint of the final results of the national economy needs to be evaluated, then, above all on the basis of the use value of the product created. As K. Marx noted, "... nothing can have value, without being an object of utility. If the thing is used less, so is the labor contained in it; the labor does not count as labor, and therefore creates no value."* Measuring inputs of resources from this standpoint necessitates a knowledge of the actual conditions of the product's exploitation or use. When this approach is used, one ordinarily finds many inputs which are not obligatory from the standpoint of the production structure's (the product, the manufacturing process or the system of machines) performance of its functional purpose.

Costs which have been incurred or are being proposed can be analyzed from the standpoint of the real usefulness of the product (ob"yekt) being studied and those costs can be divided into those which are absolutely essential (expedient) and those which are superfluous (representing a loss) by the FCA method. The usefulness of costs is verified by taking into account the level of their participation in performance of the functions that make up use value. The significance of the respective functions (basic and auxiliary) is compared to the size of the outlays attributable to their physical embodiments.

Aside from the functional approach, the FCA method has a number of other inherent peculiarities:

i. the comprehensive and systematic nature of the analysis of resource inputs;

ii. the strict organizational and procedural sequence governing performance of the analysis by the stages of operation;

iii. the universal nature of its use;

iv. recourse to reliable systematized data on the most progressive solutions of the problem being analyzed;

v. collective creative exploration for optimum technical solutions by means of specialized methods of activating creative thought;

vi. preference for analysis of future costs rather than costs already incurred.

Each of these peculiarities is important in and of itself. Any of them can help in avoiding the causes that give rise to superfluous costs. Yet the method yields its greatest economic gain when the entire set of these peculiarities are taken into account. Six years of experience in using FCA in the electrical equipment industry confirms that the transition should be made from performing functional cost analysis to solve individual partial problems, however great the economic benefit might be, to its use in a systems context.

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* Marx, K., and Engels, F., "Polnoye sobraniye sochineniy" [Complete Works], Vol 23, p 49.

Materials intensiveness, energy intensiveness and capital intensiveness can be reduced in any industry only on the basis of a goal-oriented system for management of resource utilization. But management systems of this kind do not exist at present in most industries. It is possible that many experts in the economy will consider this assertion too severe. After all, every ministry of an industry or sector is concerned with the problem of reducing the costs of the product it produces, and they are oriented toward this by planning targets for reduction of production cost, for the rise of labor productivity and the profit rate, and for raising the relative share of products in the superior-quality category. Moreover, in drafting its technical-industrial-financial plan every enterprise and production association links assignments for output and sales to assignments for better resource utilization. All of that is true.

But even at the level of the all-union industrial association (VPO), not to mention the industrywide ministry, these technical-industrial-financial plans are not drafted. They have been replaced by a set of planning targets which, though they are interlinked, are not reinforced by a system of specific measures aimed at resource conservation, as is done at the level of the primary economic unit. What we have said does not mean that such measures do not exist. But they are worked out and implemented piecemeal and unsystematically.

A great effort has been under way in the electrical equipment industry to improve resource utilization, simultaneously embracing several directions. For instance, 19 comprehensive programs for creating lines of electrical products are being carried out in order to create economical and up-to-date designs of electrical equipment. Much attention is being paid to improvement of technology, and the industry's own machinebuilding capability is being created to manufacture one-of-a-kind production equipment. R&D projects to develop standard technology and production equipment, aimed at reduction of labor intensiveness and improvement of the quality and reliability of new products, have become an integral part of preparing the production of new products. The formation and development of production and scientific-production associations for purposes of concentration of production, production specialization, integration and industrial cooperation are continuing. The interaction of ASU's [computerized management system] of enterprises and production associations with the ASU of the sector or industry is being strengthened.

It is obvious that these lines of effort are aimed at better use of the resources allocated for the industry's use. Nevertheless, these amount to only individual steps toward creation of a system for management of resource utilization, but they do not themselves make up a system. Moreover, there is much duplication, and they are not all interrelated from the standpoint of costs and benefits. Certain very important lines of effort are developing at the expense of others which are equally important.

Three years ago an attempt was made in our industry to unify certain of these lines of effort within the framework of a long-range industrywide program for conservation of physical resources. It is specifically assigned to every VPO and covers the following:

i. creation of new designs with improved weight characteristics and faster organization of their production;

ii. improvement of technology (creation of waste-free and low-waste technologies, use of progressive methods of processing);

iii. improvement of the organization of production (raising the level of norm-setting, orderly collection of waste and its use, creation of centralized work sections for cutting up materials and cutting out patterns);

iv. use of materials which are more effective from the standpoint of total resource consumption.

An analysis of the content of these programs in their breakdown by VPO shows that their effectiveness, the extent to which they have been backed up by the necessary specific measures, their linkage to the outlays to accomplish them, and the rate of progress in their fulfillment have not been uniform at all. The reason is the lack of a uniform methods approach to shaping programs which can apply equally to the utilization of labor and financial resources, as well as fixed capital, that is, to the sum total of production resources.

In our view comparative assessment of existing losses could become the key link in the industrywide system for management of resource utilization. Losses take many different forms. Some of them occur in manifest form, and one can get an idea of them from reported data. Others are discovered in the course of additional analysis, in comparing planning data, standards and report data on products of the same kind from related enterprises. Still others are hidden behind a screen and appear at first to be purposive costs. Specialized research and specific forms of technical-and-economic analysis are required to discover losses of this kind.

There are an extremely large number of causes behind the occurrence of unnecessary costs. We will name only some of them. The creation of any production system that is optimal from the technical-and-economic aspect is the result of the labor of a great many specialists, who use information and new materials, on standards, and on the most progressive solutions in product design and production engineering. One reason for unforeseen losses is that information of this kind is lacking. The same thing applies to information on prices and costs of various types of resources and on the severity of the shortage of particular materials, intermediate products and components.

The lack of a creative approach in the stage of product design is another factor tending to create excessive costs. Sometimes the designer stays with the first version of the design, which guarantees the operability of the system being created, and does not make an effort to find other versions which are more economical. Cases are not infrequent in which provisional design features, which are by no means the most expedient, remain in the documentation until the product is withdrawn from production because of the load on designers and production engineers.

Sometimes recommendations which assault the traditional approach to a particular problem are rejected because of a "resistance to change" complex, which is based on past experience and settled habits. Even work directions which are essentially tially progressive can often cause overexpenditure of physical and labor resources if they are made the basis of activity though their economic purposiveness has not been taken into account (for example, standardization of components and assemblies of several modifications of a model, each of which is planned for large-scale production).

The threat that losses will occur increases particularly when complicated engineering systems are being created. The narrow specialization of designers working on the individual elements of the system tends to separate them from one another and makes it difficult to take decisions that are most advantageous for the functioning of the system as a whole and that are based on the interests of the consumer and take into account the costs of installation, repair and everyday operation.

The classification of losses by the reasons for their occurrence and by types of resources and the drafting of specific measures to reduce and prevent losses should become inseparable elements of the system for management of resource utilization. Such a system has been drawn up in outline form in the Ministry of Electrical Equipment Industry. But for such a system to function in its finished form a great deal of preparatory work remains to be done. We are referring not only to defining all the pathways for obtaining reliable information on the true size of losses and factors causing them. Specialists in all fields must take a new approach to defining the category of losses. It is indeed such an approach that the method of functional cost analysis embodies. FCA stands in the way of excessive expenditure of resources unless it adds additional useful characteristics which the consumer needs. Numerous examples from the practical activity of enterprises and scientific organizations of Minelektrotekhprom [Ministry of Electrical Equipment Industry] can be cited as proof of this.

For instance, a study of the actual operating conditions of electrical products has shown that cases of their improper use resulting in overconsumption of resources are not infrequent. For example, expensive modifications of a product being produced are ordered without need. Products are chosen with respect to one or two parameters (capacity, say, or starting torque) without taking the rest into account. Old electrical products are included as components in new products that have been developed though more economical new ones exist.

In recent years Minelektrotekhprom, by agreement with USSR Gossnab, has been conducting an analysis of applications of especially scarce types of cable products, asynchronous low-voltage AC electric motors up to 100 kw and over 100 kw, and low-voltage (up to 1,000 V) electrical equipment. In all cases there was a saving on physical and other inputs thanks to correction of the original order.

For instance, after agreement was reached with customers on the correct product application, which was done by a special design office of the cable industry, conductors and cables with teflon insulation and cables with silvered strands and shielding were replaced by cables with insulation made from polyethylene, polyvinyl chloride and other materials which are not so scarce. In the 1977-1980 period this saved the economy physical resources amounting to more than 7 million rubles.

Analysis of the technical-and-economic justifiability of consumer use of automated circuit breakers which was conducted by specialists in Kharkov and the replacement of certain circuit breakers by others as a result of that analysis brought about a savings in the years of the 10th Five-Year Plan amounting to 815 tons of rolled products of ferrous metals, 183 tons of nonferrous metals, 1,880 tons of plastics, and more than 10 tons of silver. The value of these materials exceeded 4.5 million rubles.

The All-Union Scientific Research Institute for Product Design and Engineering and Production Engineering in the Machinebuilding Industry did a great deal of work to bring about proper application of electric motors in the 1977-1980 period. It turned out that only certain organizations take into account the technical-and-economic advisability before choosing motors for pieces of machinery being built. Most do not have methods for choosing them.

The Voronezh GSKB [State Special Design Office], for example, installed in machines for postharvest processing of grain motors intended for operation in a corrosive environment (for example, in livestock houses), though a different version of the same motors could have been used here and cost more than 20 percent less. Optimum replacement of asynchronous electric motors in the AO, AOL and 4A series following a check on their application with more than 50 developers and consumers made it possible to achieve an economic benefit of about 9 million rubles in the economy.

This analysis of applicability also had another result. People in the institute undertook to draft uniform recommendations for all consumers on the selection and application of motors for general-purpose and special-purpose (within an industry) pieces of machinery. The introduction of these recommendations will make it possible to simplify consent procedure and practically eliminate errors in electric motor application. Losses now occurring in the economy will be prevented thereby. Unfortunately the work done in this direction by Minelektrotekhprom is not at present being supported by the USSR State Committee for Standards, which favors abolishing restrictions on the use of components and is thereby involuntarily promoting uneconomical expenditure of resources to produce them.

The electrical equipment industry has gained the most weighty experience in conducting functional cost analysis of products which have been put into production. Over the 1977-1980 period production associations, enterprises and scientific organizations in the industry carried out FCA on several hundred products. The economic benefit from introducing the recommendations drafted according to the results of FCA in that period exceeds 30 million rubles. This direction of FCA turned out to be especially productive with the staffs of enterprises and organizations belonging to the all-union industrial associations Soyuzelektromash, Soyuzlektroapparat and Soyuzelektrosvet, which are engaged in large-scale product manufacturing.

The use of FCA in the R&D stage, so as to avert unnecessary costs, is also yielding notable results. For example, mechanical engineers of the Novosibirsk Scientific Research Institute of Electric Drive Systems use the FCA method to create a new system for automatic control of the machining of parts on metal-cutting machine tools that takes up half the area and consumes half the materials of the product it is compared to. From the functional standpoint, the reliability of the new system is greater, and it has broader application. A number of fundamentally new solutions have been found that considerably simplify the design of machine tools for which the system is intended, thereby raising their productivity.

If FCA is to become not only a method of solving problems, but in fact a principal weapon in combating losses in an industrywide system of resource management, the relevant organizational and economic conditions have to be created. The work to create those conditions has been following several directions simultaneously in the Ministry of Electrical Equipment Industry.

First, reference and procedural materials on FCA are drafted. First of all, these were the "Basic Principles on Organizing and Conducting FCA in the Electrical Equipment Industry," which mainly concern products already being manufactured. They were then used as the basis for preparing subindustry instructions in which the peculiarities of using the method were defined as a function of the product produced in various all-union industrial associations. Practical application of these materials on methods has shown that they need quite a bit of refinement, especially when FCA is used on product lines and also on products with a complex structure. At many enterprises (in the electrical insulation and cable industry, in power semiconductor instrumentmaking) the sphere of production technology, in which the approach to the analysis of functions is quite different than in product designs, turned out to be extremely important.

Functional cost analysis has its peculiarities in the initial stages of the creation of new products. They can be detected only when the general principles have been "checked out" on specific examples of FCA of R&D projects. Several scientific staffs in the industry were commissioned to do this work. A summary of their experience will be made the basis of the industrywide method for conducting FCA in the stage of new product design. The practical recommendations on conducting the analysis in its individual stages (selection of the sequence in which problems are to be solved, work with information, work with functions, recourse to the various methods of technical creativity, and so on) are in need of enrichment.

Then there is a need to devise special FCA procedures framed in concrete terms for particular applications--selection of materials, verification of the soundness of technical requirements, the design engineering of the product, the development and refinement of manufacturing processes, organization of basic and auxiliary production, and the organization of management and work. These methods would have to be dovetailed with all the normative documents regulating scientific research, production and economic processes.

The effort is continuing to popularize the FCA method among supervisory and engineering and technical personnel as an instrument for organizing efficient economic activity and to have as many specialists in the industry as possible master the elements of FCA. Seminars are organized to that end, lectures are delivered, the results of the analysis are demonstrated in exhibits and displays, the results of the industrywide competition for the best work in FCA are totaled up annually, and various forms of training are used through the system of improvement of qualifications, the trainee system and course of all kinds.

Special bodies and subdivisions for FCA are being created in the industry with competent specialists capable of organizing application of the method in all units within the industry. These entities are supposed to merge organically with the existing structure for administration and management of the industry. The structure of the bodies and services responsible for FCA in Minelektrotekhprom is described below.

The coordinating council for FCA, headed by a deputy minister, exercises general supervision and provides general coordination. The council supervises the drafting of normative and methods documents, hears reports of heads of VPO's, production associations, enterprises and scientific organizations of the ministry on fulfillment of calendar work plans, evaluates their activity, and takes decisions to settle disagreements between participants in these efforts. Similar functions are performed at their own levels by the councils for FCA of all-union industrial associations and committees for FCA of production associations, enterprises and scientific organizations.

In every VPO head institutes have been designated for FCA; in them specialized subdivisions have been organized which plan projects and provide methods supervision: monitoring and accounting of the progress of FCA projects and of applying its results at enterprises of the subindustries; analysis of specific products according to the institute's own field.

The subdivisions of production associations, enterprises, scientific research institutes and design offices, which organize the actual performance of the relevant projects, are the central link in the structure for management of FCA. These are usually offices with a small staff that are made up of highly qualified specialists that have gone through the necessary training in use of the method under the specific conditions of their own enterprises and organizations.

FCA is actually carried out in practice by research teams, the forms of whose activity are distinguished by great diversity. These may be temporary working groups made up of specialists of one or more subdivisions of an enterprise that have been recruited to solve a particular problem, groups of specialists of several enterprises and scientific research organizations, and so on. The mandatory requirements for the work of such groups is that their participants have a mastery of the FCA method and that they conduct the projects under supervision of permanent FCA subdivisions.

The diversity of the tasks arising out of the need to increase production efficiency and the uneven level of preparedness of the industry's plants, institutes and design offices for use of the method have given rise to still another form for organization of the efforts. In 1979 base centers for FCA were formed in every VPO (they now number more than 40), and they took responsibility for the following:

i. exemplary performance of the entire program of efforts to organize and conduct FCA and to apply its results to production;

ii. approval of the draft versions of new reference and methods materials;

iii. summarization and popularization of progressive know-how;

iv. participation in the training and consultations of the subindustry's specialists.

Still another line of effort is related to ensuring economic motivation for reduction of resource consumption on the basis of FCA. For several years the industry has been developing methods of evaluating and stimulating scientific and production activity oriented simultaneously toward the cost-accounting (khozraschet) benefit of the production efficiency project carried out and toward the benefit to the national economy of the product created by the industry. Economic instruments are related to minimizing aggregate costs. The latter include the following:

i. expenditures for scientific research projects;

ii. production cost;

iii. shipping costs for delivery of materials, components and shipment of the finished product;

iv. costs of operation, servicing and repair of products, assemblies, manufacturing processes and large engineering systems;

v. the costs of recovery of products which have served out their life;

vi. capital investments required to perform all stages of the life cycle of these structures, prorated as current costs by means of the standard efficiency coefficient.

We will describe briefly the individual elements of the system of economic motivation aimed at results obtained by means of FCA. In accordance with the decree of the USSR Council of Ministers dated 21 December 1978 and entitled "On Transition of the Ministry of the Electrical Equipment Industry to the New Conditions of Planning and Economic Incentives," the economic benefit from conducting scientific-technical measures to raise the level of production, to improve the organization of work and to perfect management was included among the assigned indicators of the activity of the ministry and its subordinate associations and enterprises. Out of the saving obtained as a result of performing those measures 15 percent is credited to economic incentive funds for the creation, production and application of new technology. When new or improved products, relatively cheaper materials and more productive methods of processing are used in production (with no deterioration of quality indicators), the wholesale prices of that product are set so as to provide for retaining the proportion of profit obtained from selling the product being replaced, but not less than the standard rate of profit. An indicator that is new in its content is being tried as an experiment in the industry: the growth of the volume of commodity output in comparative prices so as to take into account the quality and efficiency of new technology. It is calculated by changing the indicators of the base year. In accordance with the standard set in advance for each new product awarded the state Quality Emblem, the share of the economic benefit from its use by the consumer is calculated. The sum of these benefits for the aggregate of all new products is subtracted from the volume of the commodity output of the base year. The purpose of this estimate is to compensate for losses of manufacturing enterprises in terms of the growth of output, labor productivity, and wages occurring in connection with the manufacture of the new product and to motivate them to increase the efficiency of its use by the consumer.

The elements we have described do not, of course, solve all the problems of guaranteeing the economic motivation for use of FCA. Further research and study of practical experience are making it possible to devise specific forms of awarding bonuses to participants in FCA projects, to establish a more successful relationship between the size of bonuses and awards for efficiency proposals, and to determine incentive supplements to prices when products are modernized with the help of FCA.

If the FCA method is to become the basis for linking together the industrywide system of management of resource utilization, there are also certain other organizational and economic problems that need to be solved.

The industry's specialists are indeed already at work on them. In this work they need help from USSR Gosplan, the USSR State Committee for Science and Technology, the State Committee for Prices, the State Committee for Standards, and the State Committee for Labor and Social Problems. Something else is also obvious: It is worthwhile to develop the experience of Minelektrotekhprom in order to make it accessible to every industry.

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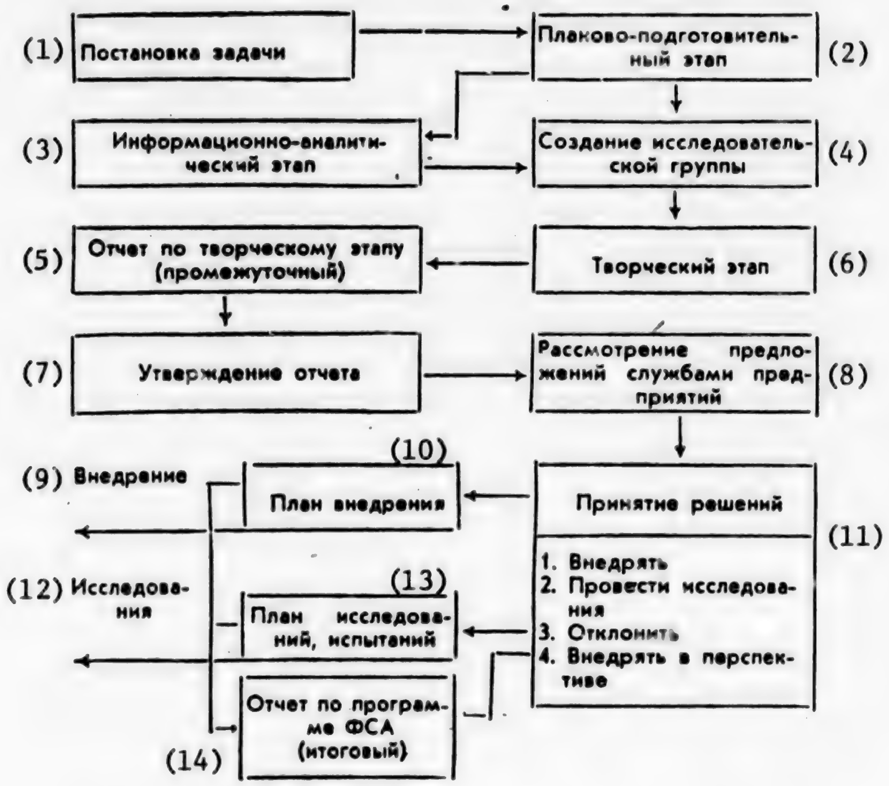
Lamp Production Under FCA

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 6, Jun 81 pp 19-23

[Article by V. A. Yesin, head of the FCA sector, and E. G. Syrov, senior staff scientist of the Scientific Research Institute for Electric Drive Systems, Novosibirsk]

[Text] It was the feeling in the production association Elektroagregat that every possible opportunity for economy had been exhausted in the production of lamps. The product had been in production for many years, and the special design office had done good work to improve the design and manufacturing process, and efficiency experts had provided more than 70 proposals in just the last 4 years. But the program of operations that was carried out (see the block diagram) proved once again the effectiveness of functional cost analysis.


(1) Постановка задачи
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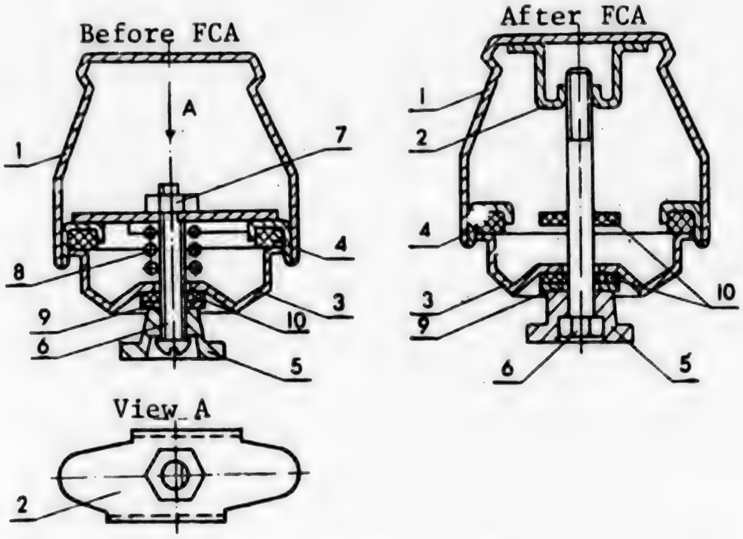
(12) Исследования
(13) План исследований, испытаний
(14) Отчет по программе ФСА (итоговый)

Block diagram of the FCA program for the lamp.

Key: 1. Statement of the problem
2. Stage of planning and preparation
3. Stage of information and analysis
4. Creation of the research team
5. Report on the creative stage (intermediate)
6. Creative stage
7. Approval of the report
8. Examination of the proposal by staff services of enterprises
9. Application
10. Plan for application
11. Taking of decisions: 1. Application; 2. Conduct of research; 3. Correction; 4. Future application
12. Research
13. Plan of research and tests
14. Report on the FCA program (final)

The analysis showed that 7 parts of the latch must perform 10 auxiliary functions (Table 1) for the lamp to perform its basic function (see the figure). A new design of the latch reducing the number of parts and operations was proposed (Table 2).



Lamp latch assembly.

In the 2 weeks of the creative stage the research team consisting of specialists of the plant and institute offered more than 30 proposals aimed at reducing the labor and material costs in production of the lamp. Following a thorough analysis and partial summation of the proposals, 10 recommendations were submitted to the management (Table 3), whose introduction made it possible to reduce the production cost of the product 3.7 percent thanks to reduction of the parts list and the reduction of the number of operations. The proposals of the research team were broken down into two phases. There were no particular difficulties in performing the four proposals in the first phase within the year. The other six proposals went into the group for future application. They are the most effective, but their performance involves solving complicated problems (changing suppliers, obtaining requisitions for materials, equipment, and so on).

Performance of FCA was timed for the preparation of production of a new modification of the lamp, making it possible to apply the recommendations in the first phase. These efforts were included in the plan of organizational and technical measures for new technology, and this made it possible to conduct all the necessary research and tests and to manufacture the necessary jigs and fixtures. Four recommendations resulting from FCA were applied in 1978, affording an economic benefit of 27,900 rubles, including a reduction of labor intensiveness by 10,600 quota-hours.

The participants in the program became convinced that the functional approach gives thought full play, and they realized the results offered by thorough economic examination of design solutions, a group creative effort and mastery of present-day methods of increasing creative output.

Table 1. Analysis of the Assembly's Functions (before FCA)

Parts of Assembly	Functions	Basic	Auxiliary	Cost Per 100 Products	
				Labor Input, in quota hours	Materials, in rubles
Catch (two)	Tightening the body of the lamp against the lamp panel to make a tight joint and its easy removal	*	*	3.263	27.64
1. Cleat--item 2	Latching and tension		*	0.445	0.50
2. Thumbscrew--item 5	Increasing the tension		*	0.694	20.00
	Turning the screw		*		
3. Screw--item 6	Transmits the increased tension		*	0.707	6.00
	Adjusts the cleat's position "closed--open"		*		
	Used for mounting the parts in the assembly		*		
4. Nut--item 7	Fastens the cleat		*	0.076	0.60
5. Spring--item 8	Tightening		*		
	Releases the cleat		*	0.111	0.12
6. Washer--item 9	Protects the rubber washer from mechanical damage		*	0.100	0.20
7 Washer--item 10	Seals the connection	*		0.060	0.24

Table 2. Analysis of the Assembly's Functions (after FCA)

Parts of Assembly	Functions	Basic	Auxiliary	Cost Per 100 Products	
				Labor Input, in quota hours	Materials, in rubles
Catch (two)	Opening and closing tight joint	*	*	1.928	24.10
1. Cleat--item 2	Latching	*	*	0.845	0.50
2. Thumbscrew--item 5	Increasing the tension	*	*	0.412	20.00
	Makes the connection with the screw		*		
3. Bolt--item 6 (purchased)	Transmits the increased tension		*	...	3.92

Table 2 (continued)

Parts of Assembly	Functions	Basic	Auxiliary	Cost Per 100 Products: Labor Input, in quota hours	Cost Per 100 Products: Materials, in rubles
4. Washer--item 9	Protects the rubber washer from mechanical damage		*	0.100	0.20
5. Washer--item 10	Seals the connection (first)	*		0.060	0.24
	Keeps the catch in its seat (second)		*	0.060	0.24

Table 3. Results of the FCA Program for the Lamp

	Quantity in Product				Cost Reduction Per 100 Products	
	Of Parts		Of Operations			
FCA Recommendations	Before FCA	After FCA	Before FCA	After FCA	Materials, in rubles	Labor Input, in quota hours
First phase:						
1. Reduction of cleat fasteners	22	18	9	5	0.510	0.420
2. Changing the fastening of capacitors	4	2	4	1	0.287	0.430
3. Changing the design of the catch, two	14	12	18	11	3.538	1.335
4. Changing the fastening of the wire guard	4	4	4	3	0.145	0.464
Total applied	44	36	35	20	4.480	2.649
Future:						
5. Changing the material of the wire guard and its manufacturing process	3	3	6	3	10.500	0.430
6. Reduction of the welding points on the side plate	--	--	--	--	--	0.230
7. Changes in the configuration of the case and lining	--	--	--	--	8.000	1.500
8. Changing the design of bulb sockets	10	6	12	5	0.500	22.600
9. Changing the process of manufacturing the panel	--	--	4	3	--	0.420

Table 3 (continued)

FCA Recommendations	Quantity in Product: Of Parts, Before FCA	Quantity in Product: Of Parts, After FCA	Quantity in Product: Of Operations, Before FCA	Quantity in Product: Of Operations, After FCA	Cost Reduction Per 100 Products: Materials, in rubles	Cost Reduction Per 100 Products: Labor Input, in quota-hours
10. Changing the lamp's mounting brackets	2	1	4	2	1.000	0.460
Total for the future recommendations	15	10	26	13	20.000	25.640
Grand total for the program	59	46	61	33	24.480	28.289

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FCA Efforts in Industrial Association

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 6, Jun 81 pp 24-29

[Article by D. I. Berger, candidate of economic sciences, and Ya. Sh. Sosnovskiy, VNIIPreobrazovatel' (All-Union Converter Scientific Research Institute), Zaporozh'ye]

[Text] The subbranch for the production of power-converting devices made the transition to systematic use of FCA in the second half of 1979, but the preparation began much earlier and pursued several directions.

The system of FCA units in enterprises, head NII's [scientific research institute] and VPO's [all-union industrial association] envisaged by the industrywide "regulation" was set up, and regulations and instructions defining their status were prepared. A summary schedule-plan was prepared by product item which envisaged that FCA be carried out at all enterprises and embrace 18.5 percent of the subindustry's costs. The coverage of products by the FCA method was mainly determined by the peculiarities of production; at certain enterprises with the series-type production it went as high as 30 percent or more, but where small-series production of a large number of products was predominant, typical coverage for the production of converted devices was 5-8 percent.

Specialists drafted several versions of methods guidelines for the principal product items so as to take into account the peculiarities of production and in which they described the procedure for assembling and preparing data and for working out solutions.

The material on methods took into account the most important peculiarities of the subindustry's principal product items requiring a specific approach in the use of FCA. To be specific, in the case of converter devices these are the complexity of the design, the predominance of the small-series type of manufacturing, the high relative share of new products in view of the frequent replacement of product models. Given those conditions, it was recommended that individual functional zones of complicated units be chosen as the subjects for FCA--standard assemblies and parts whose improvement would have a decisive effect on the technical level of the products and on the level of production costs.

The materials on methods prepared by VNIIPreobrazovatel' are being used by the subindustry's enterprises as aids in teaching the methods of FCA and in organizing projects for FCA of specific products or processes.

Thanks to the comprehensive preparatory work that was done, most enterprises of the subindustry undertook practical FCA projects back in 1978. More than 40 innovative teams were created and have been at work; their members--designers, production engineers, economists and efficiency experts--number more than 300. All the subindustry's enterprises made the conversion to use of FCA by the deadline which was set, in the second half of 1979.

The First Results

By the beginning of 1981 FCA recommendations had been applied to 51 products of processes with an annual economic benefit exceeding 3 million rubles. The benefit was achieved by reducing the labor intensiveness of products by 520,000 quota-hours, by virtue of a saving of more than 600 tons of rolled steel products, several hundred tons of nonferrous metals, about 500 kg of silicon of semiconductor purity and a number of other materials, as well as through a saving on purchased components.

A number of the recommendations which were implemented have importance to the entire industry: for example, the work done in one of the associations to save on semiconductor silicon by applying larger-diameter wafers, and by selecting optimum cutout configurations. Though a more expensive grade of silicon is used, a total benefit of about 600,000 rubles is achieved because of the sizable reduction of the amount of the material consumed and reduction of the labor required in processing.

FCA has also been applied to consumer goods. For instance, at one of the enterprises recommendations have been implemented to simplify the electrical circuit for control and protection of the SPN-400 semiconductor voltage regulator for black-and-white and color television sets. The circuit, which does not include a transformer, made it possible to substantially reduce the weight of the structural elements (for example, the weight of the power panel from 0.4 to 0.25 kg), which extended over a year offers a saving of 25 tons of electrical equipment steel, 3.5 tons of copper winding wire, and it made it possible to eliminate 42 job slots. The regulator's production cost was reduced 6 percent. At the same time reliability was increased, it became more convenient to use, and its external appearance was also improved.

They have become especially evident in carrying out the FCA program for the power thyristor unit, which was conducted under the methods supervision and with the help of our institute's FCA laboratory. The point of departure in selecting the object of study was that the unit is an integral part of a number of series of thyristor converters. The product had long been in production, a certain backlog of technical ideas had built up concerning it and have demonstrated the possibility of optimalizing the design and the manufacturing technology and of reducing the production cost. The decision to take the entire unit as the subject of analysis, rather than a part of it, would have made it necessary to study several thousand assemblies and parts, which would be unfeasible in the present stage of application of FCA.

The seven-member research team included design engineers from the developing division and related divisions and also production engineers and economists. A major part of the preparatory work and the standard operation were assigned to the association's FCA organizer and the institute's FCA laboratory so that the participants in the research team would have more time for creative work. Information on foreign analogs and data on innovation proposals (including those previously rejected) were gathered, physical prototypes of parts, block diagrams of interaction between assemblies and parts, and the recommendations and suggestions of divisions and services were assembled. In order to discover the unnecessary functions and uneconomical solutions in the various zones of the subject of the analysis 40 questions were prepared concerning different aspects of the design and manufacture of the product and its elements. Aside from the members of the research team, other specialists who had taken part in advancing and discussing the ideas were also invited to certain sessions.

Our experience confirmed the high effectiveness of the various methods of awakening creative thought, but work still needs to be done on many things. The functions were defined and classified in seven brief meetings (lasting about 1 hour), the functional zones were identified, and ideas and technical proposals for improvement of the product were advanced and selected. In all, 56 ideas were noted down in the minutes of the team, 11 of them were taken to the level of technical proposals (suggesting, for example, elimination of the insulating panel on the anode side, replacing the silver coating of certain parts with lead-nickel coating, reducing to one-half the number of sealing strips, and so on). It is interesting that certain technical findings were based on innovative proposals which had been previously rejected. This time, since they were backed up by the collective opinion of specialists in different services and a thorough engineering justification had been provided for them on the basis of Soviet and foreign information, some of them were adopted, and concerning others, which pertain to particularly crucial assemblies and parts, it was deemed advisable to conduct additional tests to verify their soundness.

The technical solutions proposed thoroughly and comprehensively cover both the design and the manufacturing technology, and at the same time they guarantee that the unit performs its basic purpose. Calculations have shown that application of the set of recommendations makes it possible to reduce the unit's manufacturing cost by approximately 100,000 rubles per year, accomplished by reducing the labor input by 18,000 quota-hours, a saving of 7 tons of rolled steel products, 8 tons of copper, 15 tons of brass, 29 kg of silver, 6.3 tons of plastics, as well as a saving on components. When the applicability of a number of parts in other units is taken into account, the economic benefit increases by another 30-80 percent. Reduction of the unit's production cost will be about 8 percent when all the recommendations are applied (on the basis of direct costs). And yet this product was manufactured for many years, and thus all those years excessive costs were permitted!

The recommendations of the research team were discussed in all aspects in a section of the institute's scientific-technical council, and responses were obtained from the services which would be putting them into practice. Certain recommendations were carried out in the same year with the resources of the developing division itself. Others requiring lengthy tests, the manufacture of new jigs and fixtures and substantial reworking of the technical documentation turned out to be unfeasible [sic] for application in the form of development of a new generation of units which would replace the existing ones over the next 2 or 3 years.

Things Worth Thinking About

An analysis of the first results of introducing FCA has shown that favorable conditions need to be created for applying the method both in carrying out formal programs and also in the everyday activity of every engineer. Unfortunately certain managers are still inclined to look upon FCA as a short-lived campaign, and this is having an effect on the organization of projects.

It is generally recognized that the major portion of a product's cost (70 percent or more) is determined in the stage of its design. An example of applying the recommendations for the power thyristor unit serves as a vivid confirmation of the effectiveness of FCA in the preproduction stage. Among the measures for further development of the method, then, a special place is being given to preparation of methods materials and to creation of conditions for use of FCA in the stage of product design.

Lengthy periods of time for drafting and application of FCA recommendations are one of the bottlenecks. In a number of cases timely information on projects being conducted at other enterprises on similar products or processes would make it possible to entirely eliminate certain stages or to sharply reduce the time they take and the cost of carrying them out. To that end we regularly summarize the results of FCA products in the subindustry and make this information available to all enterprises.

In order to make information support of FCA projects more effective, we have begun to build up a relevant data base consisting of an "idea bank" and a "data bank." Their specific source is the results of work done by the innovative teams. Topic indices of literature on FCA and related matters are issued; these are used for training in FCA methods and in conducting studies of specific products and processes.

The program of FCA projects in the subindustry for the 11th Five-Year Plan makes provision for the most effective directions of the method's use, its extension to the design stage, to standardization projects, to manufacturing processes, and to auxiliary and service operations. The technical-and-economic substantiation of the selection of products and processes will be strengthened on the basis of an analysis of labor intensiveness, materials intensiveness, and a comparison with the best foreign analogs.

Effective development of the method requires that several general problems be solved at a higher level. The method's advantages can be fully manifested only if it is introduced on the scale of the entire industrial sector or at least a set of interrelated industries; this will make it possible to overcome departmental barriers. A comprehensive approach is also needed in solving such problems as material incentives for participants in development projects, especially in the stage of R&D; inclusion of the materials of an analysis that has been performed in the system for certification of quality and setting of prices on new products; problems in coordination of the activity of different subdivisions of enterprises concerned with efficiency expertise in production (BRIZ [Bureau for Innovative Proposals and Inventions], NOT [scientific management], and subdivisions for economic analysis) in which FCA specialists have the leading role; and reflection of the results of FCA in reports on measures aimed at technical progress.

Results of FCA for the SS-56 Lamp (annual production program 76,000 units)

Element	Before FCA	After FCA	Result
Parts manufactured, number of units	52.00	21.00	- 31.00
Standard parts, number of units	58.00	22.00	- 36.00
Total number of parts, units	110.00	43.00	- 67.00
Ferrous rolled products, tons	154.90	1.10	-153.80
Nonferrous rolled products, tons	0.24	--	- 0.24
Rubber, tons	2.43	0.76	- 1.67
Plastics, tons	23.94	94.62	+ 70.68
Light filters, thousands of rubles	91.20	--	- 91.20
Sockets, thousands of rubles	13.68	8.36	- 5.32
Labor input, thousands of quota-hours	61.68	58.27	- 3.41

Note: The anticipated economic benefit is 103,000 rubles.

Popularization of the method needs to be stepped up on the scale of the entire economy, the publishing of literature on FCA and systems analysis needs to be expanded considerably, and there is a need to increase the output of educational and popular-science films and series of slides with explanatory text. The time has come to train FCA specialists in all the country's VUZ's, above all for the machinebuilding specializations. At the same time the future specialists need to be given knowledge in the field of systems research. It is worth thinking about creating permanent advisory courses for systematic improvement of qualifications in the field of FCA. Enterprise specialists have also made the proposal that a series of lectures on FCA be included in the curriculum of the system for economics education and the present 30-hour course of schools for young production innovators. The latter would undoubtedly help to swell the ranks of proponents of FCA among the large army of production innovators and inventors.

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Leading Institute Role in FCA

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 6, Jun 81 pp 30-36

[Article by V. A. Glezer, engineer and economist of VNIIElektroapparat (All-Union Scientific Research Institute for Electrical Apparatus), Kharkov]

[Text] The manufacture of low-voltage apparatus is one of the leading subindustries of the electrical equipment industry with respect to the volume of its output and the importance of the products it produces. The reason why low-voltage apparatus is widely used in all industries is that more than half of the electric power is consumed in production processes involving low voltage. The growing pace of electrification is making it necessary to achieve a corresponding increase in the output of low-voltage apparatus. This problem has to be solved within the confines of definite limitations concerning physical and labor resources. A particularly acute shortage is felt for a number of materials which have been traditional in the manufacturing of low-voltage apparatus, materials like silver, rolled products of nonferrous metals, molding compound, etc. That is why a reduction of materials intensiveness and labor intensiveness of products is our priority task. Efforts to mobilize unused production potential has always had a leading place among the topics of our institute, including the discovery and disssemination of progressive know-how obtained from comparing the production costs of products of the same designation manufactured at different enterprises. Performance of these projects has yielded a large portion of the saving resulting from applications (62 percent), though in number they were only 15 percent of the total. On the average the saving per recommendation for improvement of design was 21,300 rubles, as against 2,300 rubles for measures concerning the production process, that is, they turned out to be ninefold more effective.

Taking the principles of FCA as their points of departure, the institute's specialists analyzed changes in design recommended by enterprises on the basis of results of interplant comparisons and established that most of them were aimed at eliminating unnecessary functions. Identification and utilization of design potential has not been systematic in the subbranch, and has been carried out on a small scale. The share of reduction of production cost thanks to this factor has annually represented between 5 and 8 percent of the total amount of the saving from the measures of technical progress, or between 15 and 22 percent if the benefit from substitution of materials is included. The rest of the saving (between 78 and 85 percent) has been the result of improving the methods of product manufacturing. The results of interplant comparisons and an analysis of the effectiveness of the measures of technical progress led to the conclusion that closer attention had to be paid to finding potential in the area of design improvement using the methods of FCA. The institute's proposals have been approved in a session of the economics section of the subbranch's scientific-technical council, and on its recommendation the management of the VPO [all-union industrial association] adopted the following decisions:

i. that design improvement projects need to be developed with the same intensity as projects to improve manufacturing processes and the organization and management of production;

ii. that functional cost analysis is to be used for this purpose, above all for the products already in production, and then also in the stage of new product design and in the field of the technology and organization of the management of production.

After FCA was included as a topic in the institute's work plan, the first FCA instruction was drafted in 1974 for products already in production, and it was tried out on certain pushbutton and keyboard parts and assemblies. FCA groups were organized at four plants by order of the VPO, and a head group was formed in the institute consisting of the heads of a number of divisions. But the organizational aspect of the method's introduction contained shortcomings, and its assimilation at the plants has thus not really begun. Within the institute these projects were concentrated in one of the groups for technical-and-economic research and were conducted by a small number of enthusiasts on their own initiative.

In 1975 the institute revised the FCA instruction, tried it out on the AZ160 automatic circuit breaker and submitted it for examination to the top management of the VPO along with recommendations concerning the organizational foundations for the method's introduction. An order of the VPO entitled "On Introducing FCA at Enterprises and Organizations of Soyuzelektroapparat" was issued. The institute was given responsibility for the following: methods and organizational support of the method's assimilation; the planning and coordination of FCA projects on the basis of summary schedule-plans approved for 3-5-year periods; ongoing monitoring of their fulfillment; summarization of progressive know-how; the rendering of practical aid to enterprises; and improvement of the FCA method and the organization and planning of FCA projects. All enterprises, associations and organizations received from the institute the instruction on FCA and the necessary consultations on its use.

In 1976 Soyuzelektroapparat was the first of the all-union production associations in the industry to begin introduction of FCA on a planned basis.

A laboratory for FCA and interplant production cost analysis was organized with the facilities of the FCA group in the institute's technical-and-economic research division. Specialists in interplant analysis already had the necessary experience and qualifications, but there were many things that were unclear and many unresolved problems concerning aspects of the FCA method and its practice and organization of FCA projects. There turned out to be an acute shortage of specialists who could provide aid to the enterprise in this area, and there were few specialists with an engineering education. At first it was necessary to recruit people from among economists with an engineering degree who had production experience.

From the very first steps of introducing FCA it was necessary to overcome mistrust, a biased attitude toward the method, and an erroneous interpretation of FCA as extra work over and above the plan. This situation is typical of anything new. Many specialists, especially from among design engineers, committed a well-meaning error of thinking that "FCA is what we have been doing all along." The skeptics said: "The FCA fad will die out just like certain other initiatives."

But taking into account the need to overcome the psychological barrier, the FCA instruction included a section on promotion which revealed the method's high effectiveness with a number of simple illustrations. But even that turned out to be insufficient. Then we organized explanatory work: We demonstrated the high effectiveness of FCA with foreign experience and with illustrations from our own practice. The institute's report on experience in application of FCA in the subindustry was delivered in 1976 in a collegium of the ministry and was used to a considerable extent for issuing the order on assimilation of the FCA system in the industry. Our specialists became involved in measures to draft industrywide materials on standards and methods, in holding seminars, in training specialists, and so on. The institute sent out the instruction on the conduct of FCA for low-voltage apparatus to more than 200 plants in the industry, where it served as the basis for commencement of work on FCA. Taking into account the ministry's order and the practical experience that had been gained, the institute prepared the draft of a VPO order on further development of work on FCA in the subindustry. Since the manufacturing of low-voltage apparatus has now essentially become the proving grounds of the industry for introduction of FCA, this order was cleared with a number of leading functional administrations of the ministry and was subsequently included as a model in the normative document "Regulation on Organization and Conduct of FCA in the Electrical Equipment Industry."

A qualitatively new stage in mastering FCA began in 1977 with issuance of the VPO order which called for measures defining the following:

i. the structure for management of the FCA system, which has been organically incorporated into the present system of management of the VPO's enterprises and organizations. It calls for the creation of a head institute for FCA; committees and subdivisions for FCA are being organized in all enterprises and production associations or FCA organizers are appointed, and the functions they are to perform are defined;

ii. procedure for planning FCA projects and for implementing the results in the system of measures for new technology and establishment of quarterly progress reporting.

The institute's FCA laboratory was reorganized as an independent subdivision which retained the topic area of interplant comparisons; its staff was supplemented by a design engineer and a process engineer, and as a result of the joint effort of various specialists a definite universality was achieved. By the beginning of 1977 FCA projects were being conducted at 14 of the 23 enterprises and production associations.

At the same time a number of factors sprang up which adversely affected the further development of FCA projects. The most serious of them were that certain enterprise managers underestimated the FCA method as a highly effective instrument for raising the level of production, the shortage or absence at enterprises of people who had mastered the method, and the institute's limited capability to extend effective aid to enterprises. The institute proposed to the VPO management a number of measures to correct these shortcomings. For instance, since 1977 four or five managers have reported in the council of directors on the status of FCA projects at enterprises, including the head institute's evaluation of their activity along that line. Twice a year this question is taken up by the economics section of the subindustry's scientific-technical council. Regarding aid to enterprises as a most important line of effort and taking into account the FCA laboratory's restricted staff of specialists, the institute has organized three forms of this effort:

1. The institute itself participates in carrying out three or four joint projects which enterprises are doing on the basis of job orders.

2. FCA is carried out by the staff of the laboratory on the basis of one or two job orders, and the plants manufacturing the given products are brought in as coparticipants.

3. The institute extends aid to enterprises working on job orders or without them by means of detailed instruction and consultations of plant specialists sent to the institute.

The results of this kind of organization of the effort has led us to new conclusions.

Performance of FCA on the basis of job orders puts enterprises in a position where they must carry them out. This is the most effective organizational form in the period when the method is being assimilated.

The methods and practical aid of the institute's specialists, who have mastered the method and practice of FCA, is indispensable to competent performance of these projects, since the overwhelming majority of enterprises do not have such people. The institute's participation provides an effective form of collective practical training of a group of staff members of the enterprise in the FCA method and makes it possible to conduct convincing propaganda for FCA on the basis of concrete results. Participation of the institute's personnel in introduction of the FCA method precludes the tendency which has been noted in some places to pass off for FCA any of the projects previously conducted or performed for purposes of responding to the job order.

Feedback is equally important: The qualifications of the institute's specialists are increasing, and summarization of know-how is helping to improve the method and the organization of projects.

Experience has revealed the urgent need for efficient organization of the conduct of FCA in such a complicated system as a machinebuilding enterprise. It is one thing when FCA is carried out at the institute by a team of qualified specialists who know the purpose and tasks of the project as a whole and its content its content in each stage. It is something else when FCA is carried out at an enterprise, where at present it is something unusual, and where the participants do not have the same clarity and understanding of the task as a whole. The FCA work plan in the form of a list of stages and the consolidated content of the work involved in each of them does not always afford the necessary clarity. There is a need for a plan that unambiguously defines not only the list of all the operations, but also the sequence of their performance in each stage, the place of each operation and its interrelationship with the other operations. All the participants, regardless of their role in carrying out FCA, must know the aim of the project and their own place in it. This determines the quality with which assignments are performed and the ultimate result of the entire project.

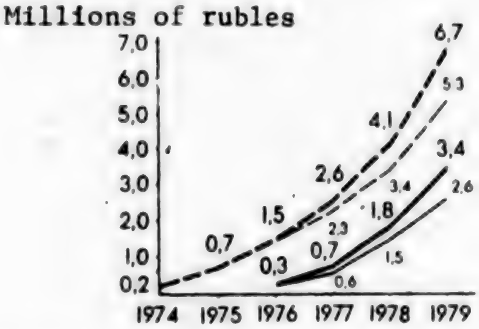
To improve the quality with which FCA projects are organized, the institute drafted guidelines on methods of organization and activity of temporary working groups when the institute is involved in FCA projects being carried out by enterprises and when enterprises are involved in carrying out FCA projects of the institute. They define the status of the temporary working group, the organization of its effort in the stages of FCA, they regulate the group's relations with the coparticipating subdivisions, the possibility of enlisting individual specialists who work in the temporary working group though they are not members. It recommended that the director of the design service be appointed the participant responsible for performance of the project. Serious attention was paid in the regulation on the temporary working group to standard network schedules for conduct of FCA, which constitute a detailed work plan indicating operations, the sequence of their performance and the interrelationship among them. It has been proposed that in the near future the regulation on the temporary working group should be finally revised, approved and sent out to enterprises.

In the 1978-1979 period a number of improvements and additions suggested by experience in joint projects were made. The methods guidelines will be revised to take them into account and will be approved in the near future. Substantial changes have been made in planning. Beginning in 1981 all enterprises in the VPO will be conducting projects envisaged by the summary FCA plan-schedule for the VPO over the 11th Five-Year Plan, exclusively on the basis of job orders. The head institutes are providing the enterprises methods and practical aid concerning the products list assigned them, as envisaged by the summary plan and embodied in the job orders. The work culminates in compilation of the schedule-plan for application approved by the management of the enterprise, and also, if necessary, with the drawing up of FCA recommendations. The schedule is cleared with the institute when it is a coparticipant in the project. The draft of the job order for carrying out recommendations is appended to the report. Then the job order for application is drawn up. As in the past, we believe one of the main directions over the next 3 to 5 years will be extending methods and practical aid to enterprises in assimilating the method and improving its application and in expanding the field of its application. The effectiveness of businesslike and creative cooperation between science and production is confirmed by specific results. For instance, of the total potential for reduction of production cost revealed by the FCA method, amounting to 6.7 million rubles, the share of enterprises performing projects in which the institute was involved represented 5.3 million rubles, or 79 percent. Of the 3.4 million rubles obtained from applying FCA recommendations, 2.6 million rubles, or 76 percent, pertained to projects in which the institute participated. Thus the major portion of the potential and its utilization were obtained from projects which enterprises performed jointly with the institute.

The successful cooperation between science and production in the field of FCA can be illustrated by experience with the Kursk Elektroapparat Production Association. During 1978 and 1979 three projects were carried out under job orders: the association was the principal participant for two of them, and the institute for the third. The products on which FCA was conducted comprised about 40 percent of the cost of the association's commodity output. Particular attention was also paid to this association because it has been designated the central facility for FCA. The set of operations involved in applying the method should be set up in exemplary fashion in that association.

In our opinion, during the 11th Five-Year Plan FCA should be assimilated by enterprises to the point where the transition can be made to its use at a higher level. By this we mean the transition from target planning of individual operations to the planning of FCA as an organic integral part of measures for technical progress--in the field of improvement of design during modernization, in the stages of creation of new designs, and in the fields of technology, organization and production management.

Effectiveness of FCA Products in the 1974-1975 Period
on a Cumulative Basis, in millions of rubles



╍╍ Total potential identified by the FCA method
- - - Total for projects in which the institute was involved
━━ Total potential realized on the basis of FCA recommendations
—— Total for projects in which the institute was involved

Effectiveness of Recommendations Resulting From Interplant Comparison of Production Cost

	Direction of Recommendations	
	Change in Design	Change in Production Process
Lowering production cost		
In thousands of rubles	1,300.0	800.0
Percentage of total	62.0	38.0
Application of recommendations		
Number	61.0	342.0
Percentage of total	15.0	85.0
Calculated effect per recommendation, in thousands of rubles	21.3	2.3

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FCA Peculiarities in R&D

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 6, Jun 81 pp 37-39

[Article by Ye. A. Oleynikov, doctor of engineering sciences, professor, Moscow Institute of the National Economy imeni G. V. Plekhanov]

[Text] Extensive application of functional cost analysis of series-produced products has made it possible to establish that shortcomings in substantiation, in design and in producing the experimental prototype of the new product are the principal reason for the occurrence of excessive costs. The task arises, then, of seeking out methods that make it possible to substantially reduce these failings.

Optimum combination of experience in the introduction of FCA with the specific nature of design based on use of systems analysis has made it possible to work out the first variants of the FCA method in the stage of R&D. The new method comprises a set of measures based on systems analysis of technical and economic factors which are performed in strict order of sequence and are aimed at obtaining the maximum use value of the product while at the same time retaining the functions which are given in the conditions or are known from an analog.

The FCA method in the stage of R&D is "incorporated" into the existing system of designing. It is well known that it is based on the order of sequence for developing a product according to the GOST [state standard] (technical assignment, technical proposal, and so on), which ends with acceptance of the plant run of the new product by the interdepartmental commission. The order of sequence of FCA items was determined so as to take into account that product development usually begins with exploration and substantiation of the choice of the best version (extensive information is used for this). The first stage of FCA applied to series production, the information stage, can, then, be omitted in its application to R&D. The method includes the stages of creation, analysis and recommendation, but they differ essentially in their tasks from the respective stages of FCA applied to series production. The criterion of the effectiveness of FCA is also basically different. Whereas in the former case it is the minimum production cost, in the latter it is the maximum ratio of use value to total manufacturing cost and preproduction outlays for the product. The criterion of the effectiveness of FCA applied to R&D takes the form:

$$K = P_{UL}/(P_{LL} + C_{PP}) \rightarrow \max!$$

with the restriction $K \geq 1.15$ and constancy of the product's basic function, in which

P_{UL}--upper limit of the product price (money estimate of the use value), in rubles;
P_{LL}--lower limit of the product price (projected price), in rubles;
C_{PP}--costs of preparation of production, in rubles.

We will demonstrate the distinction between the FCA method applied to R&D from the same method applied to series production by taking two stages of R&D--completion of scientific research and the basic design.

In the Stage of Completion of Scientific Research

The creative stage includes selection, analysis and assessment of the technical and economic characteristics of domestic and foreign analogs of the product, exploration of variants of the design and manufacturing parameters that perform the basic functions of the product most economically. The methods of collective expertise, collective discussion and "brainstorming" are used in performing the tasks of the creative stage.

In the analytical stage the initial data are sought out and values pinpointed for the computation of the upper price limit (use value), for manufacturing and for the costs of preparation of production for each variant of the product, and the values of the FCA effectiveness criterion are computed.

In the recommendation stage the basic function of the product is stated, the best version of its design and manufacture and economic parameters is chosen, and the level of the FCA criterion is set. Solutions are accepted on the basis of collective discussion of the presentation of the results of the creative and analytical stages.

The supervisor of the FCA team writes up the solution and submits it for approval to the research institute's deputy director for science.

In the Stage of the Basic Design

Creative stage. Alternative designs are examined, the functions of the product and its assemblies are analyzed, and the basic and supplemental functions are determined. The tasks of the creative stage are performed using the well-known methods of function-structure analysis, morphological analysis and collective expert evaluation.

The analytical stage includes determination of the initial data and calculation of all the parameters of the FCA effectiveness criteria--the upper and lower cost limits of the product and of outlays to prepare production. Indicators of the efficiency of each version of the product are compared, as are indicators of the efficiency of the basic design and of the stage of completion of scientific research.

The recommendation stage includes selection of the basic version of the product that is the best of those examined, compilation of the plan of additional measures which need to be taken in the stage of engineering design and preparation of the working documentation.

The examples given show that the content of the stages of creation, analysis and recommendation of FCA applied to R&D are determined by the goal and tasks of each stage of product design. Moreover, the content of the stages must take into account the specific nature of the product and its level of complexity. It is accordingly very difficult to set forth an FCA method applied to R&D that would be the same for all branches and subbranches. It is quite understandable that the content of the stages of FCA will not be the same even in closely related subbranches.

Experience in using FCA in product design in the All-Union Scientific Research Design and Production Engineering Institute of Light Sources revealed the necessity for thorough preparation for performance of FCA. Courses lasting 40 hours were conducted to teach designers, production engineers and economists the rules and procedure for performance of FCA. Attention was especially paid to training heads of divisions and laboratories and the chief specialists of the subdivisions doing the designing.

Working groups made up of designers, production engineers and economists did the product development along with performance of FCA. A great deal of work was done by engineers in setting standards for materials and labor and in price setting. The joint activity of the FCA working groups with the developers yielded favorable results. For instance, in developing the SMN5-70 miniature lamp characteristics were obtained which exceeded the best exemplars, and the annual economic benefit was more than 300,000 rubles. On the basis of that experience the decision was made that in future all new products would be developed jointly with FCA working groups.

These experiences confirm that FCA applied to the stage of R&D offers constructive results, and there is reason to hope that excessive costs in the stage of series production will be considerably less. At the same time performance of FCA in the R&D stage needs thorough theoretical and organizational preparation. This method needs to be thoroughly grasped by the designers, the production engineers and the economists, and there is a need for wider dissemination of experience in organizing projects and of preparing enterprise instructions and standards for the conduct of FCA.

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Training Specialists in FCA Methods

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 6, Jun 81 pp 40-44

[Article by V. I. Kelekhsayev, engineer, chief economist of the Planning and Economic Statistics Administration of Minelektrotekhprom, Moscow]

[Text] Imported equipment arrived at the plant which was to be installed by a team of setupmen who came from a socialist country. In opening the packing crates a worker at the plant unthinkingly threw away the shipping bolts and nuts. Observing this incident, the visiting specialist gathered up all the nuts and bolts, carefully sorted them out in a box especially designed for the purpose, and told the lad: "Your country is rich, but our country does not have a gram of petroleum, iron and many things from which these machines are made...." This is a vivid example of a differing attitude toward the results of someone else's labor. Is it not one of our socioeconomic problems that many of us, who imbibed with our mother's milk a feeling of pride to be masters of a very rich country whose resources are supposedly all-inclusive and everlasting, have not learned to be thrifty with that wealth, which is by no means unlimited?

We see in functional cost analysis not only a method as such, even though it be a very effective one, but in a certain sense also as a possibility for disseminating a philosophy of carefulness and thrift. But if FCA is to become an effective instrument for reducing production costs, there has to be an orderly system of personnel training.

What Should the FCA Specialist Be Like?

Functional cost analysis is an analytical and creative activity requiring the specialist's systematic reference to various fields of knowledge. Domestic and foreign experience dictates a number of requirements specialists must meet in this area. Success can come to a man who has a broad outlook, who has a thorough knowledge of his own field, and who has certain practical experience in production or in a scientific organization. As a method for collective creativity, FCA is effectively applied only where the research team works together smoothly and in a friendly atmosphere. This means that the specialist in FCA must have the talents of an organizer and needs knowledge in the field of industrial pedagogy and social psychology. Finally, one other quality--teaching skills. Such a specialist must train and instruct personnel, and must also be able to express himself clearly, concisely and with argument.

In the "Questionnaire for Directors of FCA Subdivisions and Engineers Organizing FCA at Enterprises and Organizations of Minelektrotekhprom," which was sent out in 1979, respondents were asked to check three out of these five attributes which in their opinion the FCA specialist should have. In the responses received (about 200) the attributes mentioned were broad outlook, feeling of responsibility and inquisitiveness.

How To Learn?

The system of personnel training in the industry has been outlined in its basic contours. Training is done in the institute for improvement of qualifications of Minelektrotekhprom, at faculties for improvement of qualifications at the Moscow Power Engineering Institute and the Novosibirsk Electrical Engineering Institute, the Leningrad, Kharkov and Tomsk polytechnical institutes, in short-term seminars organized by all-union industrial associations, and at enterprises and in scientific organizations themselves.

The coordinating council for FCA of Minelektrotekhprom provides general methods supervision of the effort in training specialists; it examines and improves curricula and syllabi for training and improvement of qualifications and for popularization of progressive know-how.

Success in the introduction of FCA is predetermined to a decisive degree by the attitude taken toward it by the leaders of the bodies of management of each of the economic entities. A substantial benefit is usually achieved in cases when the top management is convinced of the method's effectiveness and support the FCA service.

Three-day seminars organized by the ministry to study the essence, theoretical foundations, economic effectiveness and sphere of application of FCA were the first steps in the planned training and instruction of specialists. At these seminars vivid examples were presented of the first practical results in the method's use.

A course entitled "Functional Cost Analysis" lasting about 12 class hours was included in the course of study for all student groups at the institute for improvement of qualifications of Minelektrotekhprom in 1978. It is not possible in that length of time to learn the practical procedures and method of FCA, but it is quite possible to convey the essence of the functional approach and philosophy of FCA: optimality, rationality, thrift in everything created by man's reason and his hands. The FCA method itself is a set of instruments embodying that philosophy, and the method is studied in 1-month courses (fulltime) in that same institute for improvement of qualifications and its six affiliates in various cities of the country.

The training of specialists in 1-month FCA courses makes provision for studying such areas as the economics and organization of production, management of scientific-technical progress in the industry, and economic legislation. Moreover, the principal content of the syllabus is naturally made up of the study of the theory and practice of applying FCA (about 50 percent of total class time).

A form of study (seminar-practicums) oriented toward the practical results of the specific functional cost analysis in order to obtain a realistic reduction of production cost is beginning to be introduced in the industry. The product chosen as the subject of the analysis is the example taken in demonstrating the practical application of the various methods, procedures and principles which taken together comprise the FCA method. In this case all the recommendations worked out in the class group are sent to the FCA committee of the enterprise or organization for approval and subsequent application.

Who Will Be Studying?

Only in 1980 did it become possible to organize FCA courses as the relevant teaching aids, methods manuals and visual aids were prepared and as a staff of trained specialized teachers of FCA was trained.

The shortage of personnel able to teach cast doubt on the possibility of carrying out the program adopted for training and improvement of qualifications. A decision was therefore made to assemble a group of the most competent people in the industry who would share jointly with the teaching staff of the institute for improvement of qualifications the responsibility for the training and graduation of the first specialists who would be teachers of the theory and practice of FCA. In 1979 the first 70 teachers were graduated.

As the physical facilities of the institute for improvement of qualifications became stronger, and as its staff of qualified teachers of FCA increased, it became advisable to diversify the forms of study, not excluding independent and correspondence study, especially for personnel of enterprises remote from academic centers.

Personnel are well informed about the organizational measures being taken by the ministry to reduce production costs using functional cost analysis because of persistent work in training the industry's specialists in the method of FCA.

How To Speed Up the Method's Introduction?

The results of applying FCA recommendations convincingly demonstrate the method's high economic effectiveness. The direct cost reduction goes as high as 20 percent or more for certain of the most successful projects, while 3-5 percent is achieved at best with the traditional approach. For the entire 1977-1980 period the ratio of cost (for the source of financing from the unified fund for development of science and technology) to the economic benefit obtained was 1:6.

FCA is being widely popularized in order to ensure the speediest introduction of the method. The means and methods used in this propaganda effort are varied. To be specific, an annual review-competition of projects for functional cost analysis has been held since 1978 by order of the ministry. The conditions of the competition have been set forth. The best project results are chosen in three rounds: In the first stage the results are totaled up at enterprises and in scientific organizations, and then the best projects of enterprises are examined by the review jury of the VPO, the five best projects from each VPO are submitted to the ministry's central jury of the review competition. It is the task of the central jury to choose the 10 best projects. The principal indicators used in evaluation are the results of applications to the size of the economic benefit, that is, the final results. The conclusion of the central jury is approved by the coordinating committee for FCA of Minelektrotekhprom, and then an order of the ministry is issued on totaling up the results of the review competition and awarding prizes to the winners.

The contest is becoming more popular: In 1980 the number of enterprises and organizations participating more than doubled, and the effectiveness of the projects submitted rose several percentage points.

Information reviews published regularly by the All-Union Scientific Research Institute for Information and Technical-and-Economic Research in Electrical Engineering (Informelektro) are conducive to the study, generalization and dissemination of know-how in organizing and applying FCA. In addition, Informelektro publishes information issues addressed directly to personnel of FCA subdivisions in which recommendations are given on various directions in the theory and practice of FCA. The scientific-technical abstract journal ELEKTROTEKHNICHESKAYA PROMYSHLENNOST' [ELECTRICAL EQUIPMENT INDUSTRY], "Industrywide Problem" series, is a periodical regularly treating the topic of functional cost analysis. The need has arisen for an interindustry periodical which would assume the mission of popularizer and organizer of the introduction of FCA on the scale of the national economy.

Over the 5 years since the beginning was made to organize efforts to introduce FCA on an industrywide basis in the electrical equipment industry a certain constructive experience has been acquired. There are unsolved problems, and new tasks and problems do arise. The industry's specialists were able to exchange this experience, to share their doubts, and to work out a program for further development of FCA at the first industrywide conference on FCA, which was held in Moscow in October 1980.

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FCA's Application Sphere Expanding

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 6, Jul 81 pp 44-50

[Article by B. I. Maydanchik, doctor of economic sciences, professor, Moscow Finance Institute]

[Text] In view of the peculiarities of the FCA method, we can assume that over the next 5 to 10 years its sphere of application will extend to diverse areas of man's activity, and that its application will expand first of all in the production sphere. Today FCA has developed furthest in the context of existing production. However, in view of the principle of seeking out potential, the greatest economic benefit can be obtained when the scientific research is being done in advance of design, and in the first stages of the design process. It is here that a detailed study needs to be made of the new needs arising in the national economy, which should in turn be used as the basis for a straightforward statement of requirements which then make it possible to shape systems of functions or a functional model. In other words, a straightforwardly defined system of functions should precede the conduct of any design project. This will make it possible in the earliest stages to reduce the potential "throwaway" costs to a minimum, to eliminate by definition the possibility that unnecessary functions will arise, and to optimize selection of those variants which embody the main and necessary auxiliary functions.

One important future field of FCA might be transition to the system of standardization of functions themselves within industrywide standards and then later in state standards, which in our opinion would make it possible to solve the problems of standardization in a new way. It would be advisable to advance such requirements concerning the product's operation and manufacturing which are taken as the foundations for constructing the functional model.

Formalization of this process by means of FCA will make it possible to choose the best solutions for the function as the subject of standardization. Organizing this effort within the branch and later at the interbranch level could result in the functional interchangeability of assembly units and parts, which would make huge resources available. It is obvious that this would require constructing a "Standardized Functions" information retrieval system on the data bank principle. This unique archive could have importance in its own right as an integrated repository of all materials on the functions performed by the branch's various products.

Machinebuilding is the predominant industry for application of FCA. Yet an equal benefit could come from the use of FCA in all other industries, above all in light industry, the food industry, the chemical industry and the furniture industry. Moreover, as shown by the experience of other countries, FCA can be used in capital construction and when enterprises are undergoing reconstruction. For instance, FCA was used as early as 1974 in Czechoslovakia in devising the master plan for construction of a plant, specifically in establishing the enterprise's functions and their performance in production, auxiliary, storage, transport, administrative and other areas. FCA is being applied most actively in investment processes. We should especially single out the possibilities for use of FCA in agriculture: for example, in field cropping (in selection projects, in choosing crops to be planted).*

The use of FCA is very important in organizing basic production. Since the size of the superfluous costs related to the organization of production is considerably greater than in the design and development of the production process, the benefit from applying this method is particularly great in this area. We will enumerate the fields of greatest promise:

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* FCA projects in field cropping have been conducted successfully in Hungary for several years.

i. working out a scheme of load flows in the principal production shops;

ii. organization of warehouse management, including shop storerooms;

iii. definition of test conditions and the organizational scheme of their performance;

iv. the product packaging system;

v. organization of incoming inspection of materials, semifinished products and components as they arrive;

vi. organization of specialized sections;

vii. determination of auxiliary functions to be performed in the basic production operation, of procedures and methods of performing those functions, and of the costs of their overall performance.

The use of FCA in organizing auxiliary production can yield a still larger benefit than in the basic production operation. It would be worthwhile at every enterprise and association to construct the system of functions of the auxiliary production operation, thereby determining the advisability of organizing internal tool fabrication, repair service, transport service, and steam power plant. By contrast with the traditional approach, it is important that emphasis be put not so much on rationalization, mechanization and intensification of the operations being performed as on identification of unnecessary functions and the corresponding unnecessary operations.

The use of FCA in the organization of work is closely bound up with psychophysiological research, with identification of the functional structure for standard work stations, with functional analysis of the plan for organization of the work station, the worker's work motions and the work station's support system.

Use of FCA is promising in the system of administration of the branch and the subbranch and management of the association and enterprise, especially in solving the problems of improving the organizational structure of the apparatus of ministries and associations, of pinpointing the functions of individual subdivisions from the standpoint of final functions, for analyzing paper flow and the character and orientation of orders, for holding various conferences, and for evaluating the effectiveness of official travel.

FCA can be used successfully in organizing the training and retraining of personnel when syllabi are being drawn up, when they are being brought into conformity with the functions to be performed by the particular operative in production, when forms of study are being worked out, and when the scope and time of personnel training and retraining are being determined.

When FCA is used in the system for supply of materials and equipment, attention needs to be paid to questions like these: Is there a real need for this type of material, is there a possibility for standardizing the materials, what are the functions in their movement from the supplier to the shop consuming them, what is the purpose of the documentation concerning the material, why is warehouse storage, weighing, cutting, and so on necessary?

Finally, FCA can be used in improving bookkeeping and accounting, statistical records and reports, and current production records and reports. For example, it is among the basic functions of the reporting system to furnish management entities information making it possible to obtain an objective and sufficiently complete idea of economic indicators at any given moment. This basic function includes an effective system of data gathering and processing, an ability to make a quantitative evaluation of all the basic processes taking place at the enterprise and in the association; responsiveness in responding to the requests of management entities; and existence of a monitoring system that guarantees the reliability of the information.

The annual costs of recordkeeping, according to our calculations, are about 15 billion rubles--a huge figure! It is important, then, to examine from the standpoint of FCA all types of requisitions and overhead, notifications and job orders, upward reports and the downward responses, every line and every square on a graph. What function do they perform? To what extent do they further management? One might draw up some interesting tables in which all the recordkeeping functions needed by the particular enterprise or establishment would be listed on the left, and on the right the various documents or indicators used to perform them. Experience shows that even with such a simple approach one discovers thousands of squares on graphs that perform unnecessary functions, while on the other hand a number of functions are not performed completely, in good time or competently. It would be possible from the standpoint of the functional approach to make a thorough analysis of the accuracy with which engineering, economic, financial and other computations are made in our country.* FCA can equally embrace analytical work, including the conduct of FCA itself.

Along with the horizontal spread, we should also expect a deepening of functional cost analysis. This presupposes a substantial supplementation of the set of methods that can be used in conducting FCA (networking, optimum planning, expert evaluation, use of regression and factor analysis, business games, and so on), as well as expanded use of computer memory for running over the variants and for seeking out the best of them with respect to the criteria adopted.

Ever greater attention is being paid to the problems of the design, management and functioning of large systems distinguished by the high number of dimensions, the particular complexity of relations and interrelations, and large outlays to create them and get them operating. A certain contradiction could arise and intensify between augmentation of the role of large systems and the orientation of present-day FCA toward relatively small subjects of analysis (systems). It is therefore necessary to begin preparation for carrying out programs of FCA of large systems, which will make the method considerably more effective. We will attempt to formulate certain general principles or, more accurately, contours of efficient use of FCA in large systems.

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* G. Ye. Edel'gauz writes: "It is difficult to answer the question of how accurate are economists' calculations. Economic calculations are probably the only field of calculations in which their accuracy is not ordinarily examined." See "Dostovernost' statisticheskikh pokazateley" [The Reliability of Statistical Indicators], Moscow, Statistika, 1977, p 243.

a. In the first stage FCA should be carried out with respect to the large system as a whole, and thereafter for the individual subsystems, including as a final stage analysis of individual products, assemblies, and so on. This will make it possible to minimize unnecessary costs to improve elements which are performing unnecessary operations in large systems, but may be basic in the subsystems at a particular level. For instance, an analysis has to be made of the entire energy system of, say, the region, and then of substations and power-generating units.

b. The benefit increases if FCA is carried out in the stage of designing large systems and decreases considerably when it is carried out in the stage of operation.

c. In order to take into account the experience of the Czech specialists, it is advisable to classify all types of large systems into high-, medium- and low-functional systems. The classifier might be the ratio of costs to performance of basic and auxiliary functions (for example, the first group would include products for which the share of costs to basic functions is less than 35 percent of the production cost, the second would receive those in the interval up to 60 percent, and the third those over 60 percent). We can assume that a sizable number of large systems will prove to be low-functional, since so far developers have been designing elements without giving due consideration to their place in large systems. Development of an FCA program for large systems will make it possible to eliminate this anachronism and to implement the systems approach in their management and design.

It is also advisable to make a periodic "inventory" of this kind for all the products being manufactured or scheduled for manufacture, using a uniform method of evaluating functionality (which has yet to be created). On the basis of the statistics built up and the relevant comparisons made both within the parametric series and also between them, it will be possible in future to establish the minimum permissible (and then also optimum) levels of functionality. They will, of course, be determined by the product model and the scale of manufacture. In other words, the larger the scale of manufacture, the higher should be the requirements for functionality, other conditions being equal. The requirements for raising functionality of individual assemblies and parts in this context should be determined so as to take into account their influence on the functionality of related assemblies and of the product as a whole. Once the check has been made for functionality, the relevant scientific research institutes, design offices or enterprises will discover whether the given design has achieved the level that was set. If not, then it obviously will be returned to the developers for reworking and a specific FCA will be conducted.

In the industrial sector an orderly system of comprehensive establishment of standards has been set up, including state standards, industrywide standards, republic standards and enterprise standards. Services for monitoring conformity to quotas and standards are operating energetically. In this context it is wise to create in future unified services that would make checks for manufacturability, functionality and conformity to standards. This will make it possible to evaluate functionality as an inseparable element of the overall system of organization, it will not require an increased staff, it will eliminate the possibility of duplication of these general technical functions, and it will make it possible to evaluate quality and economic efficiency more comprehensively.

Critical analysis of the experience gained in our country's industrial sector and that of other socialist states allows us to see the basic difficulties which can become an obstacle to development of this highly effective method. We will examine these problems and possible ways of solving them.

The present system of pricing is affording enterprises less and less adequate motivation to produce cheap and lightweight products, though the situation has changed essentially since adoption of the July (1979) decree of the CPSU Central Committee and USSR Council of Ministers. The information obtained as a result of carrying out FCA makes it possible to establish the following: first of all, in the setting of the wholesale price of a product there must be greater orientation than at present toward its performance characteristics; second, a gradual transition is needed to element-by-element setting of wholesale prices on the basis of the functions of products.

Another difficulty is a certain gap at some enterprises between FCA groups and designers, which is fraught with conflict situations. It would be advisable in future to retain small FCA groups, which are part of the structure of divisions like the division for production efficiency expertise, the bureau for efficiency expertise and inventions, and so on and would be subordinate to the association's chief engineer or his deputy. But mixed teams of specialists, above all working developers (designers, production engineers, economists, normsetters, and specialists in FCA), that would be created should become the principal "nucleus" carrying out FCA. It would be desirable if the FCA specialist were the deputy head of the team; 40-70 percent of the membership of such groups should be engineers, and the rest economists and specialists in systems analysis.

The question of personnel is also a complicated one. People working on functional cost analysis should be specialists with higher education with experience in designing and an inclination toward creative work.

The discrepancy between the functional approach and the assignment of designers (mechanical engineers above all) to particular assemblies and groups of parts could become a certain obstacle. It is advisable, first as an experiment and then on a larger scale, to make the transition to the system of assigning designers to basic functions. This can in turn necessitate specialized preparatory work for improving the organizational structure of design divisions.

It would be wise to work out special branch standards (and later possibly state standards) which would establish the volume of work related to functional analysis in engineering design and in designing as a whole and the procedure for organizing them and carrying them out. The special standards adopted in the GDR and FRG might be used in this effort; they establish the number of items under FCA and the sequence of their performance. One can assume that the systems approach to development of FCA will facilitate its becoming a generally accepted method in designing.

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INVESTMENT, PRICES, BUDGET AND FINANCE

STATE BANK'S FUNCTION IN NEW PLAN REVIEWED

Moscow DEN'GI I KREDIT in Russian No 6, Jun 81 pp 3-15

[Article by V. S. Alkhimov]

[Text] The personnel of the system of USSR Gosbank, along with all the Soviet people, welcomed the decisions of the 26th CPSU Congress with great enthusiasm and ardent approval. The 26th CPSU Congress has become an important landmark in the history of the party and of Soviet society and an event of world-historical importance.

The address of Comrade L. I. Brezhnev, general secretary of the CPSU Central Committee, comprising the report of the CPSU Central Committee to the 26th CPSU Congress and upcoming tasks of the party in the fields of domestic and foreign policy, occupied the principal place in the proceedings of the congress. The congress wholly and completely approved the Leninist course and practical activity of the party's central committee.

The address of Comrade N.A. Tikhonov, chiarman of the USSR Council of Ministers, "Basic Directions for the Economic and Social Development of the USSR over the period of 1981-1985 and up to the year 1990," was also delivered and discussed at the congress. The congress unanimously approved this most important programmatic document of the party.

The results of the constructive work of the party and people were summed up at the congress, and it was shown that the tasks advanced at the previous congress had all been performed successfully; inspiring prospects were at the same time revealed for advancement of Soviet society along the road of the building of communism.

In the years of the 10th Five-Year Plan our country moved forward along all the lines of economic and social development. In that period the economy developed in conformity with the course set by the party for a further rise in the prosperity of the Soviet people on the basis of dynamic development of social production, higher production efficiency and improved quality of performance. The country's national wealth was augmented. Growth of economic and scientific-technical potential was achieved, and there was a surge of all the physical production sectors and the nonproduction sphere. The Soviet state's defense capability was maintained at the requisite level.

Bank personnel also made their contribution to the overall achievements of the Soviet people in the 10th Five-Year Plan. All units of the USSR Gosbank system vigorously acted to raise the efficiency of social production, to speed up scientific-technical progress, to strengthen cost accounting [khozraschet] and to augment socialist accumulation.

USSR Gosbank saw to fulfillment of the targets for the circulation of money which were set in the approved cash plans. Cash plans were fulfilled at a level of 100.5 percent for the 5-year period as a whole. The income side of the cash plan was fulfilled by all republic offices. As a result Gosbank institutions everywhere saw that money was issued promptly to pay wages to workers and employees, to remunerate kolkhoz members for their work, to purchase agricultural products and for other purposes. A number of steps were taken to strengthen bank monitoring of expenditure of wage funds.

Credit relations with all sectors of the economy underwent further development and improvement. The total volume of credit-financed investments was 275 billion rubles at the beginning of 1981. Credit was extensively used to ensure a further growth of heavy industry, a faster rate of development of sectors and industries that determine technical progress, a growth of the production of agricultural products, and creation of the necessary stocks of raw materials and supplies in light industry and the food industry. Credit relations were expanded in the sphere of capital construction, especially in connection with the steps being taken to improve the economic mechanism. Now nearly every other ruble of working capital in industry is obtained through bank credit, and this share is considerably higher in agriculture and trade.

Gosbank institutions handled the financing of a large volume of capital investments and extended 40 billion rubles of long-term credit over the 5-year period, a great majority of which was assigned to further strengthening of agriculture's physical production base. Bank credits were also used to carry out a considerable number of effective measures to expand the production of consumer goods, to put new technology into production and to mechanize production processes.

Bank credit has begun to be used more widely to finance outlays to attain rated output at new enterprises and shops and in new manufacturing processes that have been put into operation and also outlays to put new products into production and to improve product quality. Credit has become more important in ensuring promptness of payment for goods and services.

Work has been done toward practical implementation of the decisions of the 25th CPSU Congress in the area of savings. Tasks were energetically performed to improve the work of savings banks, to introduce the credit transfer system for payment of the bills of individuals to trade, utilities and other enterprises, and to pay out the income of workers. The total balances of accounts of individuals as of 1 January 1981 was 156.5 billion rubles.

USSR Gosbank and USSR Vneshtorgbank [Foreign Trade Bank] vigorously promoted development of foreign economic relations and achievement of mutually beneficial cooperation of the Soviet Union with foreign countries. The targets set for the foreign exchange plan of USSR Gosbank were successfully met. All payments were made on goods imported for the economy, and the financial resources of the state were used economically. A great effort was made to provide foreign exchange services for the 22d Summer Olympic Games.

Steps were taken to further improve cash services to the economy and the system of accounting and reporting in the bank and to raise the level of mechanization and automation of bank operations.

In recent years much attention has been paid to drafting and carrying out a system of measures by USSR Gosbank to implement the decree of the CPSU Central Committee and USSR Council of Ministers on improvement of the economic mechanism. USSR Gosbank has by and large completed the drafting of the relative enactments, and many of them have already been put into effect in the practical operations of the bank and the economy. Improvement of banking legislation is continuing. The new Bylaws of USSR Gosbank have been adopted by decree of the USSR Council of Ministers.

Steps are constantly being taken to improve the work of personnel selection, assignment and training and to improve their knowledge of economics and business skills. The average wage of personnel in the system has risen more than 23.5 percent. All-union socialist competition has undergone further development in Gosbank and Gostrudsberkass [State Worker Savings Bank] institutions.

At the same time we have problems which are unresolved. Full advantage is not being taken of the opportunities for the bank to exert an influence on the economy. The style and procedures of the bank administration still do not come up to present-day requirements. The necessary thoroughness and effectiveness are not always achieved in organizing and doing the work of economic statistics. There have been shortcomings in the organization of work and difficulties in resolving problems in the social welfare development of staffs of Gosbank and Gostrudsberkass institutions. We need to take every step to eradicate shortcomings in our work.

Achievements in the domain of economic and social development make it possible for the Soviet people, including personnel of the USSR Gosbank system, to perform tasks on an ever larger scale.

The 26th party congress defined the long-range orientation of economic strategy, whose goal is the steady rise in the people's material and cultural level of living and creation of better conditions for comprehensive development of the personality. The 11th Five-Year Plan will be a crucial stage in carrying out long-range tasks; the main task of that plan, as pointed out in the Basic Directions, "consists of ensuring a further rise in the prosperity of the Soviet people on the basis of stable gradual development of the economy, faster scientific-technical progress and conversion of the economy to the intensive pattern of development, more optimum use of the country's production potential, all-out conservation of all types of resources and improved quality of performance."

In the light of the decisions of the 26th CPSU Congress and the principles and tasks advanced in the report delivered by Comrade L. I. Brezhnev, all the activity of the USSR Gosbank system is to be aimed at vigorous promotion of fulfillment of the plans for the country's economic and social development on the basis of a consistent improvement of the effectiveness of the money, credit and settlement mechanism and a strengthening of its influence toward higher production efficiency and quality of performance in all entities of the economy.

A priority task of the State Bank, as the country's sole note-issuing bank, has been and remains concern about the circulation of money, a further strengthening of that circulation and assurance of stability of the Soviet ruble's purchasing power. The indicators for economic development and the rise in prosperity of the people over the next 5 years envisaged in the Basic Directions create the necessary preconditions to accomplish that purpose.

In the 11th Five-Year Plan real per capita personal income will increase 16-18 percent. "Of course, a rise in the standard of living of the workers," Comrade L. I. Brezhnev pointed out at the congress, "means more than increasing money income. At present ... the task of improving the supply to the public of food and also of industrial consumer goods is moving into the foreground."

As the reader is aware, there are plans to draft comprehensive target programs and to carry them out in stages in order to solve this problem: a program for food and a program for development of the output of consumer goods and services. An important feature of the new 5-year plan is that the growth rates of industries in Group B is to be faster than that of industries in Group A. Higher growth rates are envisaged for the production of agricultural products: 12-14 percent, as compared to 9 percent in the 10th Five-Year Plan. Retail sales of state and cooperative trade will increase 22-25 percent over the 5-year period, the sales volume of consumer services to the public will increase approximately 40-50 percent. At the same time the line will be consistently followed of guaranteeing the stability of state retail prices of the principal foodstuffs and nonfood commodities.

Taking as their points of departure the prospects and tasks in the domain of the circulation of money, Gosbank institutions, utilizing a broad range of economic methods of influencing the economy must vigorously promote adherence to the established proportions in economic development and a faster growth of consumer goods production, retail sales and paid services, achieving on that basis fuller satisfaction of the effective demand of the public for diverse goods and services and improved relations between personal money income and expenditures.

Jointly with ministries, departments, associations and enterprises it needs to be altogether persistent in revealing more fully the potential that exists for increasing the production of industrial goods and foodstuffs for the population, for expanding their assortment and improving their quality and to promote in every way the speediest exploitation of that potential. Money and credit should at the same time be used more effectively to promote fulfillment of the assignments that have been set for the production of these goods both in the branches of light industry and the food industry as well as in heavy industry, especially by making fuller use of local resources.

It is important to show more initiative in this matter, especially since the bank's powers are still not being altogether used, and the work that has been done to seek out unused productive potential and to stimulate the output of consumer goods is still not yielding adequate results.

The 11th Five-Year Plan envisages a further development of trade and the food service industry and substantial improvement of consumer services to the public.

USSR Gosbank has extensive credit relations with trade. At present more than 56 percent of the working capital of trade organizations is built up with bank credit, which makes it possible for the bank to exert an active influence on all aspects of their activity. In the new 5-year period more attention should be paid to credit financing of trade organizations and to monitoring their economic and financial activity. There is a need to enhance the effectiveness of the bank's economic influence on the operation of trade organizations and on their fulfillment of trade plans and additional assignments and to improve the work of operational observation of the condition of trade, the prompt movement of goods into the retail trade network and correct location of inventories in the trade system.

At the same time it is important to promote more vigorously improvement of business relations between the sectors of industry and trade and to monitor more strictly fulfillment of 5-year agreements and annual contracts between them, performance of contractual obligations by wholesale trade depots and maintenance of the established minimum assortment of goods in retail trade enterprises.

Problems concerning development of the sphere of paid services should be ever more fully in the bank's field of vision. Gosbank institutions need to analyze more systematically fulfillment of plans for rendering consumer services to the public and to discover the potential that exists for fuller satisfaction of the demand of the public for consumer services and other services as well as for improvement of their quality.

It is an equally important task to improve the planning, organization and regulation of the circulation of money. It is especially urgent in this context to implement in practice the measures aimed at ensuring stability of the circulation of money in accordance with Decree No 695 of the CPSU Central Committee and USSR Council of Ministers, dated 12 July 1979. The bank's institutions should take a more active part in compiling 5-year and annual balances of personal money income and expenditures and to improve the level of soundness of the bank's computations and proposals concerning them so as to take into account the need to improve relations between personal money income and expenditures and fuller satisfaction of the effective demand for goods and services. It is indispensable to improve the regional planning of the circulation of money with a view toward ensuring a better relationship among retail sales, market stocks of commodities and personal money income in each republic, kray, oblast, rayon and city. More attention should be paid to drafting and performing measures to restrict the migration of money to economically justifiable proportions.

In the 11th Five-Year Plan the growth of personal money income will continue. The average monthly wage of workers and employees will increase 13-16 percent, and remuneration of the labor of kolkhoz members 20-22 percent. The rise of labor productivity is an important factor in economic growth. The Basic Directions call for a 17-20 percent rise in the productivity of social labor.

Proportional development of the economy and the important related tasks in the domain of the circulation of money require that the correct relationship be ensured between the rise of labor productivity and the rise of wages, that funds to remunerate labor and the awarding of bonuses be subject to strict economy, and that excesses not be allowed in their expenditure. It is accordingly becoming much more important that the bank do work in economic statistics to monitor expenditure of wage funds by associations, enterprises and organizations in order to ensure that labor productivity increases faster than the remuneration of labor and to see that the wage plays a greater role as an incentive in augmenting output, in improving product quality, and in conserving of resources of all kinds.

It is an urgent problem to adopt new regulations on monitoring expenditure of wage funds that are in conformity with Decree No 695 of the CPSU Central Committee and USSR Council of Ministers, dated 12 July 1979. All Gosbank institutions should ensure unconditional fulfillment of the instructions of the Gosbank Board on these matters.

At the same time there is a need to intensify economic influence on associations, enterprises and organizations which do not adhere to the established relationships between the growth rates of labor productivity and the average wage, which do not carry out assignments for the rise of labor productivity, which maintain a larger work force than has been planned, that commit regular overexpenditures of the wage fund and which do not see to prompt reimbursement of those overexpenditures. To this end full advantage should be taken of the bank's powers and the broad rights it has been granted, and in each specific case the most effective measures of economic pressure should be applied.

In the new 5-year plan Gosbank institutions should pay greater attention to monitoring expenditure of kolkhoz funds to remunerate the labor of kolkhoz members, mindful that on kolkhozes the level of remuneration should be made more dependent on the end results of work, on labor productivity and on product quality.

Savings banks have large and complicated tasks to perform in the 11th Five-Year Plan. The Basic Directions call for achievement of further development of savings activity, improvement of the ways in which savings banks serve the public, and fuller supply of computers and the necessary equipment to savings banks.

The Gostrudsberkass system needs to invigorate its effort to further develop savings activity, to persistently seek out ways of improving the activity of savings banks, and to vigorously adopt and popularize those types of service which are most effective and convenient for the population. Every savings bank must see that plans for attraction of the money resources of individuals are fulfilled and overfulfilled.

One of the basic tasks of the savings banks is further development of the credit transfer system in serving the public. Quite a bit of experience has already been gained in certain republics, especially with respect to payment of the income of workers. The effectiveness of this kind of settlement is obvious, and jointly with ministries, departments and enterprises they need to work more vigorously on all-out expansion of the practice of paying money wages of workers, employees and kolkhoz members through savings banks.

At the same time, work should continue to further develop the credit transfer system in which individuals make payments to trade, utilities and other enterprises from accounts in savings banks. It is also equally important to raise the level and quality of customer service and strive to make the working hours of savings banks convenient for the public. In the final analysis the task is to turn the savings banks into exemplary credit institutions for the public.

The organization of work of Gosbank institutions in its cash services to the economy is in need of attention and further improvement everywhere. The staffs handling cash and collection items must operate efficiently, all cash becoming available from circulation must go into the cash drawers of Gosbank institutions, and cash must be paid out promptly to economic organizations and individuals. If these tasks are to be performed, steps need to be taken to optimalize the entire circulation of cash, and at the same time the optimum denominational composition of cash in circulation should be assured and cross shipments of cash prevented.

It is an important task to raise labor productivity and the quality of performance of cash clerks whose job is to count money. This should be based on the creation and manufacture of highly efficient machines to sort, count and package paper money, fuller and more efficient use of the equipment that exists, dissemination of the know-how of progressive cash clerks, and expansion of the network of specialized cash branches of Gosbank.

All Gosbank institutions should guarantee exact enforcement of the rules in effect on work with currency and cash items, on the handling of money deposits and on the shipment of valuables, which should be the basis for completely eliminating cases of oversights in cash transactions and losses of government property.

The rise of the prosperity of the people in the new 5-year period will be based on steady economic growth. Particular emphasis is put in the materials of the congress on improving the structure of social production, and raising production efficiency, on improvement of the quality of products and services in all sectors and industries, on a further acceleration of scientific-technical progress, and on making foreign economic relations more effective.

Credit has an important place in performing these tasks. In his address at the 26th CPSU Congress Comrade N. A. Tikhonov referred to improvement of credit financing and funding with appropriations among the measures which need to be taken to raise the level of management and economic activity.

The Basic Directions provide:"The role of financial and credit instruments needs to be enhanced in intensifying production, in strengthening cost accounting and in tightening the economy regime. They should be used more actively in performing the tasks of faster creation and application of highly efficient new technology and also retirement of outdated technology, increasing the output of consumer goods and the rendering of services to the public, mobilization of potential within the economic entity, and elimination of unproductive expenditures and losses." On that basis credit relations in the economy should develop toward enhancement of the role of credit as an incentive in development of all sectors and industries.

Above all there is a need for further improvement of the effectiveness of the credit mechanism in development of the industrial sector. This is understandable, since it is industry that guarantees scientific-technical progress and the necessary structural shifts throughout the economy, and one-third of short-term credit investments of the bank is invested in this sphere of the economy. Primary attention in this should be paid to the use of credit to stimulate higher efficiency and quality of performance by heavy industries--the fuel and power industry, metallurgy, machinebuilding and the chemical industry.

There is also a need to do everything to promote development of the agroindustrial complex with credit. It should be emphasized that all the branches that are part of the agroindustrial complex are credit-intensive, and the amount of credit assigned to these branches will once again increase. This necessitates more optimum organization of credit and settlement relations in all branches of the agroindustrial complex, higher efficiency in the use of credit in all stages: from production of agricultural products to bringing them to the consumer.

It is an urgent problem that credit exert a more vigorous influence toward improving the performance of transport organizations and toward expansion and improved quality of communication services. In the credit financing of supply and sales organizations fuller use should be made of credit's abilities to guarantee optimum expenditure and conservation of physical resources, an uninterrupted supply of raw materials, intermediate products, equipment and spare parts to the national economy.

In the light of the decisions of the 26th CPSU Congress the role of credit in speeding up scientific-technical progress needs to be enhanced still further. Broad opportunities for this are being created in connection with the development of credit relations with scientific research, project planning, design, and process engineering organizations, associations and enterprises in the context of their conversion to the cost-accounting system of organizing the projects of creating new technology, putting it into production and applying it. In the credit financing of these organizations Gosbank institutions are expected to exert a stronger influence on the final results of their activity. At the same time they should ensure more effective use of credit to cover the production costs of new types of machines and equipment, to prepare and organize production of new products and new manufacturing processes, to cover outlays for attainment of rated production at new enterprises or phases and complexes which have been put into operation, and also to cover projects financed with the resources of the unified fund for development of science and technology.

It is a very important task to use credit as a more vigorous incentive for improvement of product quality, to augment the output of products in the superior-quality category, to expand and renew the assortment of products, to introduce more effective measures of bank influence on associations and enterprises which are not fulfilling planning targets for product quality and which are manufacturing substandard products.

A significant feature of the new 5-year period is that the final results from the standpoint of the national economy are to grow faster than labor and material costs, and more optimum use is to be made of all available resources. Everything--speeding up scientific-technical progress, improving the structure of social production, improving planning and management, and raising the level of economic performance--must be subordinated to achieving higher results of production at lower costs and with fewer resources, as noted at the 26th CPSU Congress. These instructions place a particular responsibility on institutions of USSR Gosbank for results in the effort of monitoring the economic and financial activity of associations, enterprises, ministries and departments. A certain restructuring of the mechanism of bank monitoring is needed. Its operation must be increasingly directed toward the qualitative aspect of the economy's effort. The task is to ensure effective ruble control over each association's and enterprise's fulfillment of assignments for conservation of all types of resources, over acceleration of the rate of turnover of working capital, and over the rise of the output-capital ratio. Gosbank institutions must always be mindful of such aspects of the activity of economic entities as the rise of labor productivity, reduction of various losses and waste, elimination of unproductive costs, reduction of production cost and assurance of the profitability of production.

Particular attention should be paid to all problems related to further improvement and increased results in monitoring the economic and financial activity of agricultural enterprises and organizations. Efforts of Gosbank institutions need to be concentrated on performing such urgent tasks as ensuring that sovkhozes, kolkhozes, interfarm and other agricultural enterprises make correct and optimum use of productive capital and physical, financial and labor resources, adhere to cost accounting, reduce production costs, increase the profitability of agricultural production and improve the financial and economic condition of the farms.

In the new 5-year period more appreciable results need to be achieved in the influence the bank exerts toward reduction in the economy of above-plan, excessive and unnecessary inventories, which in turn will promote more effective fulfillment of the tasks that have been set of speeding up the turnover of working capital in the national economy by 2 or 3 days. To that end the bank's institutions should thoroughly analyze the composition of above-allowance inventories and the reasons for their creation and join economic authorities in seeking out real possibilities for putting them to worthwhile economic use; increase the effectiveness with which credit extended to cover above-plan inventories is used;

and invoke more resolutely economic penalties against associations and enterprises which regularly allow such inventories to build up without good reason and do not take steps to reduce them.

One of the important practical tasks is to carry out measures toward more economical and optimum use of the nationwide loan fund. This is because in certain sectors of the economy the turnover rate of credit has slowed down, the share of credit not secured by physical collateral has increased, the state of payment discipline has deteriorated, mainly in agriculture, supply and sales, construction and a number of industries.

As thrift and conservation develop in the economy, additional prerequisites are created for making the use of credit more effective. It is the task of Gosbank institutions to strictly adhere to the principles of credit financing. At the same time they need to be more exacting toward associations, enterprises, ministries and departments with respect to unconditional adherence to the state plan and to financial discipline. In this connection the economic penalties invoked by the bank should be more severe for nonfulfillment of plan assignments and contractual obligations by enterprises and associations and for unwise consumption or expenditure of physical and financial resources. On that basis the composition of credit-financed investments needs to be improved, the turnover of credit speeded up, and the share of indebtedness under Gosbank loans which is delinquent or covered by extensions reduced.

In the present stage great importance is attributed to enhancing the role of planning as the central segment in management of the economy and to ensuring organic interaction of the plan, economic instruments and incentives. This also necessitates further improvement of credit planning, of the methods of drafting credit plans and of analyzing their fulfillment in the interest of attaining better balance of credit-financed investments and resources with plans of the country's economic and social development, with the state budget, and with the financial plans of ministries, associations and enterprises. The degree of soundness of computations of short-term credits for the 5-year period (distributed by years) for purposes of the summary financial balance must be raised in these respects.

A great effort also needs to be made to seek out and introduce more optimum forms of credit financing of economic entities with a view to further improvement of the organizational structure of management in the economy and to raising the level of economic performance in all segments of the economy. Ensuring economically expedient standardization of the forms and methods of credit financing of the various sectors of the economy should be an important direction in this effort.

In the 11th Five-Year Plan USSR Gosbank is to perform important tasks in the funding and credit financing of capital investments. This is because of the sizable growth in the volume of capital investments, above all to agriculture, and also because of the need for maximum utilization of the capabilities of the finance and credit mechanism for radical improvement of capital construction, for increasing the efficiency of capital investments, and for adherence to plans and financial discipline.

An important role should be played in this effort by performance of the set of measures aimed at improving the organization of funding, credit financing and settlement in capital construction to conform to Decree No 695 of the CPSU Central Committee and USSR Council of Ministers, dated 12 July 1979. As they are carried out, persistence needs to be shown in achieving concentration of capital investments and physical resources at the most important construction sites, restriction of the number of projects under construction at the same time, reduction of construction time, reduction of the volume of construction in process and inventories of uninstalled equipment with a view to setting the task of bringing them within the established allowances over the next several years. Fuller utilization needs to be made of the experience that has been gained in this effort. For instance, in 1980 alone 4,300 projects with an estimated cost of 531 million rubles were not accepted for financing on Gosbank's recommendation on grounds that resources were being scattered, and they were excluded from the plan, which made it possible to speed up completion of projects begun previously.

Gosbank institutions need to participate more actively in shaping plans of capital investments and also plans for funding and long-term credit financing, title lists of capital construction projects and also title lists within projects.

Particular attention should be paid in the process of funding and credit financing of capital investment projects to universal introduction of settlement between customers and contractors for enterprises whose construction has been completed and which are delivered for operation, independent complexes, phases and facilities which have been prepared for manufacturing products or rendering services, and to guaranteeing that construction contractors are promptly furnished credit to cover outlays for construction and installation work in process.

One of the most important tasks is to achieve higher effectiveness in the use of long-term credit. Particular attention should be paid to improving the planning of long-term credit over the 5-year period and to the soundness of the bank's computations for the purposes of the summary financial balance. In its examination of the engineering and economic studies supporting projects the bank should strictly monitor the effectiveness of the outlays being made on the basis of bank credit. Bank institutions should see that credit resources are assigned on a priority basis to building up a stable fodder base for animal husbandry, to rebuild, expand and reequip livestock housing, to build facilities for primary processing of farm products, to build warehouses and storage facilities, and also to complete construction projects and facilities begun previously.

It is in the interest of the overall effort to monitor more closely proper use of resources from noncentralized sources of financing. In this more vigorous use should be made of bank credit to carry out measures at existing enterprises to introduce new technology and advanced manufacturing processes, a selection being made of those which are most efficient and offer a faster return.

It is also important to use credit to help kolkhozes and sovkhozes develop subsidiary industrial operations and handicrafts to process agricultural products, to manufacture building materials and to produce consumer goods, mainly from local raw materials, and to increase the production of foodstuffs on subsidiary farms of enterprises, organizations and institutions. Attention should also be paid to providing credit to help rural individuals in private housing construction, housing construction cooperatives and individuals in developing private subsidiary farming projects, and market gardening and other partnership associations of workers and employees.

As in the past, it will be very important for Gosbank institutions to provide engineering supervision over the introduction of progressive standard designs and standard design-estimate costs in rural construction and over proper determination of the estimated cost of the marketable construction product and the cost of equipment. At the same time the quality of surveys to verify work done should be improved, and a resolute effort should be waged to combat padding, overstatement and exaggeration in construction and major repairs.

Gosbank institutions confront important tasks in organizing the credit transfer system. It has to be furnished more optimum organization, and everything needs to be done to use this type of settlement as an instrument for strengthening cost accounting, contract discipline and payment discipline in the economy. To that end more vigorous use needs to be made of the capabilities incorporated in the credit transfer mechanism for fulfilling product delivery plans with respect to the product list (assortment) in accordance with contracts concluded and observance of socialist legality in business relations.

In organizing the system of settlement, Gosbank institutions should promote the strengthening of direct relations among industrial, agricultural, transport and trade enterprises and organizations, and the strengthening, as emphasized in the Basic Directions of their mutual financial liability for punctuality and quality in fulfilling planning assignments and obligations for delivery and shipment of products in accordance with the orders of consumers and long-term contracts.

Another important direction in the bank's activity should be increased influence of the settlement mechanism toward improvement of product quality. There is a need in this connection to promote the transition, when economically advisable, to the making of payments for goods after they have been accepted with respect to quality. At the same time the effort should be continued to improve the credit transfer system for settlement of production associations, bearing in mind that the ultimate goal is to centralize these settlements, which will be conducive to the most optimum and efficient use of financial resources.

The task of conserving on all types of resources in every way is also in need of development of a system of settlements based on canceling of offsetting claims and other forms of settlement that helps to speed them up, to reduce mutual indebtedness and to economize on payment instruments.

Gosbank institutions need to pay particular attention to increasing the effectiveness of bank supervision in the credit financing of operations involved in settlement, to take every step to prevent economic authorities from using credit to reach financial gaps, and to achieve more effective use of bank credit in ensuring prompt payment of bills for goods and services and faster turnover of working capital in the economy.

Proper organization of transaction accounting has great importance to performance of all Gosbank's functions. The directions in which the level of this work should be raised in the institutions of the banks are determined above all by the tasks arising out of Decree No 59 of the USSR Council of Ministers, dated 24 January 1980, and entitled "On Measures To Improve the Organization of Bookkeeping and To Enhance Its Role in the Optimum and Economical Utilization of Physical, Labor and Financial Resources." In accordance with these tasks, all expedient steps need to be taken to guarantee the preservation of money and goods, their use for the purpose specified, enhancement of the role and responsibility of chief bookkeepers for organizing the work of handling transactions and for the condition of accounting and monitoring in Gosbank institutions. At the same time a search needs to be made for new methods of performing bank transactions, a more vigorous effort needs to be made to standardize the forms of money-settlement and internal bank documentation and to improve the quality of documents, the clarity with which they are made out, and the smoothness of their processing.

USSR Gosbank, as one of the authorities monitoring the economy, is expected to safeguard the interests of the entire state more decisively and uncompromisingly. That is why more attention should be paid in the work of Gosbank institutions to preventing cases of overstatement in the fulfillment of plans and assignments and to guaranteeing reliability of the accounting and statistical reports of economic authorities. It is essential that party and Soviet authorities be informed about violations detected in this area. Files on officials who have committed these violations need to be punctually turned over to the authorities of the procurator's office. There is a need to enhance the role of auditing in guaranteeing the legality with which bank transactions are conducted and also the preservation of money and goods.

Gosbank has important tasks to perform in raising the labor productivity of bank personnel on the basis of further mechanization and automation of that work. This is all the more important because every year we will be experiencing an increasing strain on labor resources. The main thing in this effort is to achieve a substantial increase in the volume of data processed by computer equipment and also an increase in the list of tasks performed by computer centers directed toward improving management of the circulation of money, credit, and the noncash turnover of payments.

Foreign trade and the USSR's economic and scientific-technical cooperation with foreign countries will develop further in the new 5-year period. The activity of USSR Gosbank and USSR Vneshtorgbank will accordingly be subject to higher requirements in the domain of international currency-and-financial relations and credit-and-settlement relations. One of the most important tasks in this effort should be improving the planning of foreign exchange, augmenting the role of the banks in compiling and monitoring fulfillment of summary plans of foreign exchange, plans of commodity exports and imports, and the foreign exchange plans of ministries and departments. It is very important to ensure that payments are made promptly and without interruption and that the country's foreign exchange is preserved in the context of the chronic instability of the rates of exchange of the currencies of the capitalist states.

The rapid development of commodity trade and other economic relations of the CEMA member countries makes it necessary to carry out measures to strengthen and enhance the role of the collective socialist currency--the transfer ruble. Gosbank is expected to provide the foreign exchange financing of the long-range target programs on which CEMA member countries are cooperating and also the bilateral long-range programs for industrial specialization and cooperation.

We have important work ahead of us in optimum organization of foreign exchange financial relations with capitalist countries, which have shown an interest in cooperating with the USSR, in the interests of ensuring stable and mutually advantageous trade-and-economic relations and scientific-technical relations with them.

It is very important to promote mutually advantageous trade in commodities and the Soviet Union's comprehensive economic relations with the developing countries on a long-range basis and on an equal footing.

Improvement of the credit and settlement mechanism to facilitate foreign economic relations and stronger bank influence on Soviet organizations carrying on foreign economic activity in order to make their operation more effective should be a subject of particular attention.

The banking system can also make its contribution to performing such an important task of the national economy as expanding the country's export potential and improving the quality and competitiveness of products intended for export. Here fuller use needs to be made of the capabilities of credit as an incentive for development of operations that will produce for export and for improvement of the quality of export products.

Performing the large and crucial tasks which confront the Gosbank system requires mobilization of the creative potential of its entire staff, improved efficiency of its effort, and assurance of the efficient and smooth performance of all units in the bank system. This applies above all to a stronger organizational effort and improvement of the approach and methods of that effort at all levels of management of banking activity.

At the same time there is a need for more vigorous introduction of scientific management, for punctual summarization and planned dissemination of the progressive know-how of collectives and individual workers, and for development of efficiency and organizational expertise.

Constant attention should be paid to improvement of the organization of economic statistical work in institutions of USSR Gosbank and USSR Gostrudsberkass. There is a need to raise the level with which this work is planned in all units of the banking system, to improve supervision of economic statistical work exercised by the central apparatus and offices over subordinate institutions, and to extend them procedural and practical assistance. In this connection there should be a thorough study and treatment of the principal economic problems, and the experiments envisaged by the 5-year and annual operating plans of USSR Gosbank should be competently carried out.

Emphasis was placed at the 26th CPSU Congress on the need to perform measures aimed at overcoming departmental disassociation and at improving coordination of the activity of central, sectorwide and industrywide, and local management entities. There is a need in this connection for a still more vigorous expansion of business contacts and more straightforward coordination of efforts with planning and financial authorities, institutions of USSR Stroybank, agencies of USSR Gossnab, the USSR State Committee for Standards, the USSR Central Statistical Administration, the USSR State Arbitration Commission, people's control, and other interested organizations. Joint comprehensive and special-topic analysis of economic and financial activity of associations, enterprises, ministries and departments, as well as of joint local inspections, should be practiced more widely.

The press is called upon to play an important role in mobilizing the Gosbank system to perform the tasks which confront it. Personnel at all levels of the Gosbank system should have closer contacts with the press, including the journal DEN'GI I KREDIT, they should participate more actively in preparing and publishing articles on current problems and practical aspects of the circulation of money, credit financing, settlements, the financing of capital investments, savings, accounting, automation and mechanization of banking processes, the Gosbank system's approach and methods, and improvement of the quality of its performance.

Success in Gosbank's performance of the tasks which confront it depends in the final analysis on people, on their attitude toward their work, and on everyone's thorough understanding of the importance of his contribution to the overall effort. The new 5-year plan, then, is imposing higher requirements as to the selection, assignment and training of personnel. Concern should be paid not only about improving the business skills and deepening the economic knowledge of personnel, but also, and this is especially important, to raising their ideological and political level. It is thus a question of ensuring a comprehensive approach to ideological training, work training and ethical training of personnel.

Socialist competition is a time-tested method of mobilizing the creative initiative of the workers. In the new 5-year period it will undergo further development. It is our task to improve even further the organization of competition, to make it more effective, and to aim it at achieving high quality of performance. There must be a closer connection of material and moral incentives with the results of socialist competition.

We need to continue the effort to ensure the necessary conditions for stabilizing the work force and reducing its rate of turnover, build up a creative atmosphere and wholesome social-psychological climate in every collective, and develop comradely cooperation and mutual aid in the work effort. It is the duty of every supervisor to pay more attention to solving the social problems of the collective's development, manifesting in this effort concern to improve the conditions of work and rest, housing and consumer-service conditions and the medical service for every worker. A responsive and attentive attitude toward people and their needs and requests should be seen by every supervisor as his duty to the people and to the party.

The Soviet people are full of determination to perform the formidable tasks which the party has advanced. With abundant strength and creative energy the staff of the system of USSR Gosbank, numbering in the many thousands, has actively joined in this constructive effort. And there is no doubt that the personnel of the banks will apply all their strength, knowledge and experience to successful fulfillment of the decisions of the 26th CPSU Congress and will do everything necessary to ensure more vigorous use of financial and money-credit instruments in the country's economic and social development and in fulfillment of the assignments of the 11th Five-Year Plan.

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INVESTMENT, PRICES, BUDGET AND FINANCE

GLUSHKOV POINTS OUT REGIONAL PRICE DIFFERENCES

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 6, Jun 81 pp 148-151

[Article by N. T. Glushkov, chairman of the USSR State Committee for Prices: "Regional Peculiarities Are Taken Into Account in Prices"]

[Text] USSR Goskomtsen [State Committee for Prices] has examined the article "Siberia and Time" along with excerpts from V. P. Mozhin's paper entitled "Tasks in Developing Siberia's Productive Forces."

The basic propositions in V. P. Mozhin's paper on the situation concerning regional differentiation of the prices of raw materials and fuel in order to provide advantages in development to the enterprises of Siberia need to be qualified. A more detailed examination of this issue shows that both the present price system and also the prices that will take effect on 1 January 1982 do stimulate the development of Siberia's productive forces.

1. The price list for coal, shale, the products of coal enrichment and briquettes, which is to go into effect as of 1 January 1982, embodies an improvement of the entire system of wholesale prices for coal products. The regional differentiation of coal prices has been improved. The number of price zones has been reduced from 65 in the present price list to 43 in the new one, including a reduction from 15 to 9 for West and East Siberia.

The wholesale prices on the coal of West and East Siberia afford maximum incentives for mining and efficient use of the coal by consumers. For example, so that the Kansk-Achinsk basin develops at a faster pace than the average, the wholesale prices on coal from that basin have been raised so that they remain the cheapest in the country, but the rate of profit relative to productive capital is nearly double the industry average.

On the whole the level of new wholesale prices of coal mined in West and East Siberia is 8.2 and 72.3 percent below the industry average and their production cost 11.8 and 76.6 percent below the industry average, respectively.

Whereas the average coal price in effect in the industry is 9.52 rubles per ton, the price per ton of coal in West and West Siberia is 9.64 rubles and 2.95 rubles, respectively.

As of 1 January 1982, whereas the average price of mined coal will be 13.48 rubles per ton, the price of coal for West Siberia will be 12.37 rubles per ton and that of East Siberia 3.74 rubles per ton.

2. The enterprise wholesale price of natural gas in West Siberia (Tyumengazprom) is 1.3 percent higher than the industry average, while its production cost is 11.3 percent below the industry average. In the new context of the wholesale prices to be put into effect as of 1 January 1982, the enterprise wholesale price of gas of Tyumengazprom has been set at 0.4 percent below the industry average. Both the existing prices and also the new prices afford the principal gas field the highest rate of profit, which USSR Goskomtsen considers legitimate, since production of cheap gas is thereby stimulated in the country.

At the same time industry wholesale prices of gas for consumers in Siberia, both at present and also after 1 January 1982, are 27.4 and 42.3 percent below the average industry level, respectively, for customers in Tyumenskaya Oblast (Tyumengazprom) and 21.8 and 19.2 percent lower, respectively, for those in Krasnoyarskiy Kray. Whereas the average price of gas now in effect is 17.9 rubles per 1,000 cubic meters for industrial consumers, the price has been set at 13 rubles per 1,000 cubic meters for consumers in Tyumenskaya Oblast, 11 rubles for power stations in the Surgut region and 6 rubles per 1,000 cubic meters in the Urengoy area.

As of 1 January 1982, when the average price will be 26 rubles per 1,000 cubic meters, it has been set at 15 rubles per 1,000 cubic meters for consumers in Tyumenskaya Oblast and there has been no change in the price for power stations in the area of Surgut and Urengoy.

3. New wholesale prices in the petroleum production and refining industries ensure sounder price relations for petroleum and petroleum products, which makes it possible to evaluate more correctly the benefit to the national economy of developing new deposits and exploiting existing ones.

The multiplicity of prices has been eliminated in the petroleum industry, the number of zones for enterprise wholesale prices has been reduced to a minimum, and there are three zonal prices; wholesale prices of petroleum for refineries has for the first time been set the same as on petroleum delivered for export (30 rubles per ton), regardless of the origin and method of shipment of the petroleum to the refineries and also regardless of the route by which it is delivered for export.

Establishment of the same wholesale price for petroleum will afford the refineries relatively equal conditions for acquiring the raw material and will build up realistic prerequisites for establishing uniform enterprise wholesale prices (instead of group prices) on petroleum products. The existence of uniform prices of petroleum and petroleum products will simplify planning both by suppliers (consumers) of petroleum and also by sales organizations; it will make it possible to eliminate the adverse effect of proportional shifts in deliveries of petroleum and petroleum products.

There has been a change in regional differentiation of wholesale prices of petroleum products: a two-zone division has been established instead of the three-zone division.

In view of the change that has taken place in the location of the country's petroleum refineries and also that the regions of Siberia will be entirely supplied with petroleum products from their own production during the 11th Five-Year Plan, these regions have been put in one zone.

4. The level of the rate schedules in effect for thermal energy and electric power in the center of the country's European part, in the Ukraine, and also in the power systems of Glavyuzhenergo [Main Administration for Operation of Power Systems in the South] is 60-80 percent higher than the rate schedules adopted for the power regions of Glavvostokenergo [Main Administration for Operation of Power Systems in the East].

In the new price list which is to take effect on 1 January 1982 regionalization of rate schedules for thermal energy and electric power has taken into account the new prices of fuel at points of consumption and the need to ensure favorable conditions for development of energy-intensive production operations in the regions of Siberia which are rich in their raw materials resources and fuel and energy resources. For instance, whereas in the center of the country's European part, in the Ukraine and also in the power systems of Glavyuzhenergo the average adjusted two-rate price of electric power under the new price list is 1.68, 1.80 and 1.84 kopecks per kilowatt-hour, respectively, the average for the region of Glavvostokenergo, which embraces Krasnoyarskiy Kray, Irkutskaya, Tomskaya, Novosibirskaya and Omskaya oblasts, Buryatskaya ASSR, the Kuzbass and Altay, is 0.82 kopeck per kilowatt-hour and is remaining at practically the same level established in the present price list. The level of the rates for thermal energy which will take effect as of 1 January 1982 is 30-40 percent lower for the regions of West and East Siberia than the rate schedules established for the European part of the USSR.

5. Wholesale prices of cement, both those in effect and those to be introduced on 1 January 1982, have been set on the basis of total production and distribution cost, and they are differentiated by eight zones. For instance, in the present prices Moskovskaya Oblast is put in the fourth price zone on the basis of total cost, and all the oblasts of West Siberia (with the exception of the Far North) in the second to the fourth zones.

The new wholesale prices to take effect as of 1 January 1982 encourage development of the regions of West and East Siberia by placing them in lower price zones than at present; the size of the rise of wholesale prices is 40 percent lower for West Siberia and 51 percent lower for East Siberia than the average for the industry.

6. Measures being taken to set the water charge have also been aimed at providing favorable conditions for development of the regions of Siberia. This is manifested in the fact that the charge for water is differentiated by regions. The highest rates are set for regions where there is a water shortage, and the

lowest for the regions of Siberia. A number of industrial regions of Siberia have been entirely exempted from the water charge.

Thus the wholesale prices in effect and especially those to be introduced as of 1 January 1982 take into account the regional peculiarities of the geographic and industrial configurations of the USSR and are aimed at creating the most favorable conditions for development of the productive forces of Siberia.

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